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A Civil Service examination is soon to be held of candidates for the position of Assistant Civil Engineer in the Department of City Works of Brooklyn, as announced more fully in our advertising columns. Those receiving appointments will be paid $5 per day at the start and the best of them will have the chance of rising to positions commanding somewhat higher salaries. A private letter from the Commissioner of City Works informs us that the Department desires men who have had special training or practical experience in sewer construction, or on pavements of various sorts, in addition to general engineering knowledge. Throwing open appointments of this class to general competition is so unusual that we are glad to make special note of it. There is not the slightest doubt that the Department will have a much larger and better qualified set of candidates from which to make its appointments than it would find in the ordinary run of applicants for the positions.

The hull of the steamer "St. Louis," for the American Line, was successfully launched at the Cramp Shipbuilding Co.'s yards at Philadelphia, Pa., Nov. 12, in the presence of a great crowd of spectators. President Cleveland and members of the cabinet were present, and the christening ceremony was performed by Mrs. Cleveland. The striking feature of the hull is the construction of the stern tubes for the twin screws, these tubes being worked into curved pin-like projections, so that the screw shafts will have no outboard sections, and no shaft brackets will be required. The general dimensions of the ship were given in our issue of Nov. 8. The engines have now to be put in and the interior work done, and the "St. Louis" is expected to make its first trip between New York and Southampton next spring. The sister ship "St. Paul" is still on the stocks, but work is well advanced on the hull.

The highest record for production of rails at the Edgar Thomson Steel Works, at Braddock, Pa., was reached during the month of October, the output amounting to 35,000 tons. In one 12-hour turn 1,800 tons were turned out, and on the other 1,700 tons. The best previous record for production in any one month at this plant was about 33,000 tons.

The new reservoir and mechanical filtration plant proposed for Minneapolis (Eng. News, Aug. 30, 1894) seem likely to be built soon, a joint committee having decided to recommend to councils that work be started at once. Mr. J. T. Fanning, M. Am. Soc. C. E., has reported favorably on the plans and estimates of Mr. F. W. Cappelen, City Engineer. A donation of 45 acres of land has been offered to the city for a reservoir site. The daily capacity of the proposed filters is 30,000,000 gallons and the storage capacity of the reservoir, 90,000,000 gallons.

The town of Framingham, Mass., has voted to construct filter beds for the purification of the underdrainage from its sewerage system. A reservoir will be built near the present sewage pumping station and the drain water will be conveyed to this and pumped thence to the disposal area. The sewage of the town is now disposed of on land, as fully described in our issues of Nov. 23, 1889, Aug. 11, 1892, and Feb. 23, 1893. The sewerage system and disposal area were provided largely for keeping sewage from the Boston water supply, that city agreeing to pay $25,000 towards the construction of the system. Underdrains were laid beneath the sewers and the water from these has been discharging into the Boston water supply ever since. On this account Boston has refused to pay Framingham the stipulated sum and at last the town has decided to purify the underdrainage, towards the expense of which Boston has promised $6,000, with the understanding the $25,000 already mentioned will also be paid as soon as the underdrainage is purified. About 18 acres of land will be purchased, at a cost of $1,100. The estimated cost of the new work, not including the $1,100 for land, as submitted by Mr. J. J. Van Valkenburgh, of South Framingham, is as follows:

Reservoir of 270,000 gallons capacity	$6,147
Drain, suction and force mains	2,303
Pumps, foundations and connections	1,735
Land	1,100
Preparation of beds	800
	$12,165
Add 10 % for engineering and contingencies	1,217
	$13,382

The construction of several branches was decided upon by the Metropolitan West Side Elevated Ry. Co., of Chicago, at the meeting of the stockholders held Nov. 9. The present main line of this road runs from Franklin St. west, practically between Jackson and Harrison streets, to the city limits, and besides this main line a branch to Humboldt Park is being constructed. The first of the proposed branches is to run from the main line north to the city limits on a route between the Chicago River and the lake shore. The second branch will start from the main line on the west side of the river and run south and southwest to Blue Island. Both the other new lines are branches of the Humboldt Park branch and both will run to Cicero, but, of course, by different routes. The stockholders, having voted for the new construction, the company will now have to secure ordinances permitting their construction. It will doubtless be some months before any steps can be taken toward actual construction, even if everything works satisfactorily in the city councils.

The most serious railway accident of the week was a head collision Nov. 7, on the Baltimore & Ohio R. R. at Rosensteel, Pa. The westbound Chicago express had orders to pass an eastbound stock train at Pine Grove, but the engineman misunderstood or disregarded the orders and was making for the next siding at Rockwood. Passenger trains usually have the right of way, which may have led the engineman to forget the special order, which was given on account of the heavy grade against the eastbound train. Both engines were wrecked, the mail car and two express cars telescoped and several cattle cars were smashed. Six men were killed (four trainmen and two mail clerks), but none of the passengers were hurt.

Another explosion caused by careless thawing of dynamite cartridges has occurred, this time at Huntington, Ind., by which three men were killed, Nov. 9. The men were employed by the contractors for the Flint Creek sewer, and were thawing about 50 lbs. of explosives at a fire, ready for rock blasting.

The bridge carrying the Chicago Great Western Ry. over Stillman Creek, near Rockport, Ill., gave way under a coal train Nov. 10, and three men were injured. The bridge was being rebuilt.

A new six-story building just completed for the Montreal Street Railway Co., at Montreal, Can., collapsed Nov. 9, and two men were killed. A brick partition wall carried up to the top floor supported iron columns upon which the roof rested, and it is reported that a part of the wall gave way letting the columns down, the heavy roof then falling through the floors.

The bursting of a supply main to a stand-pipe at Selma, Ala., reported recently, turns out to have been only the blowing out of a defective lead joint. A new pump was being tested when a joint failed near the pump, causing a shut-down for several hours, but doing no damage. We are indebted to Mr. Thos. Gaichell, formerly Superintendent of the Selma Water Co., for this information.

The reservoir and canal embankment at Ansonia, Conn., which failed on Nov. 3, washing out some 200 ft. of the tracks of the New York, New Haven & Hartford R. R., belonged to the Ansonia Land & Water Power Co. Press reports indicated that this was a failure of one of the reservoirs supplying water for domestic uses, as stated in our issue of Nov. 8. It is said that there was formerly a waste gate in the embankment, designed to draw the water from the reservoir when desired. Railway tracks were afterwards laid on the bank at this point and the bank strengthened, the old sluiceway being filled in. It is suggested that the water worked its way along the old sluiceway and undermined the embankment.

Trials with the Hurst multi-charge gun, described in our issue of Sept. 27, are now being conducted at Indian Head. So far, the tail of the projectile has been broken off in each test, and steel projectiles are to be made before further tests are conducted. With the largest charge used, 184 lbs., a velocity of 2,452 ft. per second was secured, with a pressure of 15.8 tons on the powder chamber. How much this velocity and the pressure were affected by the loss of the 100 lb. tail to the projectile can only be guessed at. Wheeler-Sterling and Midvale Steel Co. projectiles have also been tested recently at the same grounds. These projectiles were designed for penetrating thin armor and then bursting inside. Both were fired against a 7-in. nickel-steel plate with a velocity of 975 ft.-sec. Both went through the plate and were recovered comparatively uninjured. Two other shells, made by the Taylor Iron & Steel Co. and the Carpenter Co., broke on striking the plate, the latter after the point had gone through the plate. This test is to determine the acceptance of several hundred shells for our warships. The tests are to be continued.

The New York & Philadelphia Traction Co. has obtained a New Jersey charter to construct the system of electric railway lines for which the franchises have been obtained by the Central New Jersey Traction Co. This system, as proposed, would include a continuous line between New York and Philaldelphia and would fairly gridiron the central and northern sections of New Jersey with lateral lines. The capital of the new company is $10,000,000 and its officers are Frank A. Magowan, President, and J. Henry Darrah, Secretary and Treasurer; its offices will be in Trenton, N. J., and New York city. The entire system will comprise about 250 miles of electric railway and the charter permits these lines to carry not only passengers, but also local freight of all kinds; this latter work to be done at night on specially constructed cars. It is said that construction will begin at once from Paterson southward. The system to be used is the overhead trolley with all the latest improvements.

The last pin in the Louisville & Jeffersonville Bridge, crossing the Ohio River at Louisville, Ky., was driven on Nov. 5 at 5:20 p. m. This is the structure on which a serious accident occurred on Dec. 15, 1893, as our readers will remember. After that accident work was suspended for some time. On Sept. 5, 1894, the first material for three new spans was placed in position, and just two months later the work was completed. It is believed that this record of progress in bridge erection has never been equalled in a work of such magnitude carried on under such dangers and difficulties. The three spans erected to complete the bridge are each 553 ft. long between centers of end pins, the longest pin-connected bridge spans, not of the cantilever type, ever erected, so far as we recall. The work of erection involved the driving and removal of about 900 piles; the framing of about 600,000 ft. of falsework and its erection and removal three times; the framing and erection of a traveler 65 ft. long and over 100 ft. high, and the raising and putting in position of the metal work of the span, amounting to nearly 6,000,000 lbs. The height from the bottom of the river to the top of the traveler was about 225 ft., and during the progress of erection it was necessary at four different times to call the erectors off the work on account of wind storms so severe that the men could not even walk on the falsework.

EARTH EXCAVATION ON SECTIONS I AND K, CHICAGO DRAINAGE CANAL.

(With Inset.)

We illustrate on our inset sheet this week the general construction and operation of the excavating plant used by Messrs. Christie & Lowe, on Sections I and K, of the Chicago Ddrainage Channel, for which they are the contractors. These sections adjoin each other and begin about three and one-half miles west from the Bridgeport terminus of the canal. The contract was signed Dec. 23, 1893, and called for the excavation of 2,300,000 cu. yds. of "glacial drift," the material being actually a hard compact clay, weighing 3,150 lbs. per cu. yds., and breaking out with the steam shovel in large pieces often several tons in weight. The depth of the cut averages 38 ft., and it is 110 ft. wide on the bottom and has side slopes of 2 to 1. The system adopted for handling the earth may, for the lack of a better name, be called the bridge conveyor system, and it has been patented by the contractors. It should be stated, however, that owing to an unavoidable delay in securing the necessary machinery, and to keep up with the contract requirement as to monthly progress, 5 ft. in depth over the entire two sections was moved by teams, using wheel scrapers, and New Era graders and wagons.

The general arrangement of the excavating plant as it is now working is shown in the plan, Fig. 1. There are really four separate and independent excavating and conveying outfits, each consisting of a bridge truss across the spoil bank, an approach incline, and a series of dump car and steam shovel tracks across the bottom of the excavation, with all the necessary hoisting machinery for operating the cars by cables. The excavation is made in two cuts, and beginning at the center of the two contract sections proceeds in opposite directions, two conveyors working east and two working west.

Referring to the drawing, Fig. 1, the shovels supplying conveyors Nos. 1 and 2 make the top cut and those supplying conveyors Nos. 3 and 4 the bottom cut. Conveyors Nos. 1 and 4 work east and conveyors 2 and 3 work west.

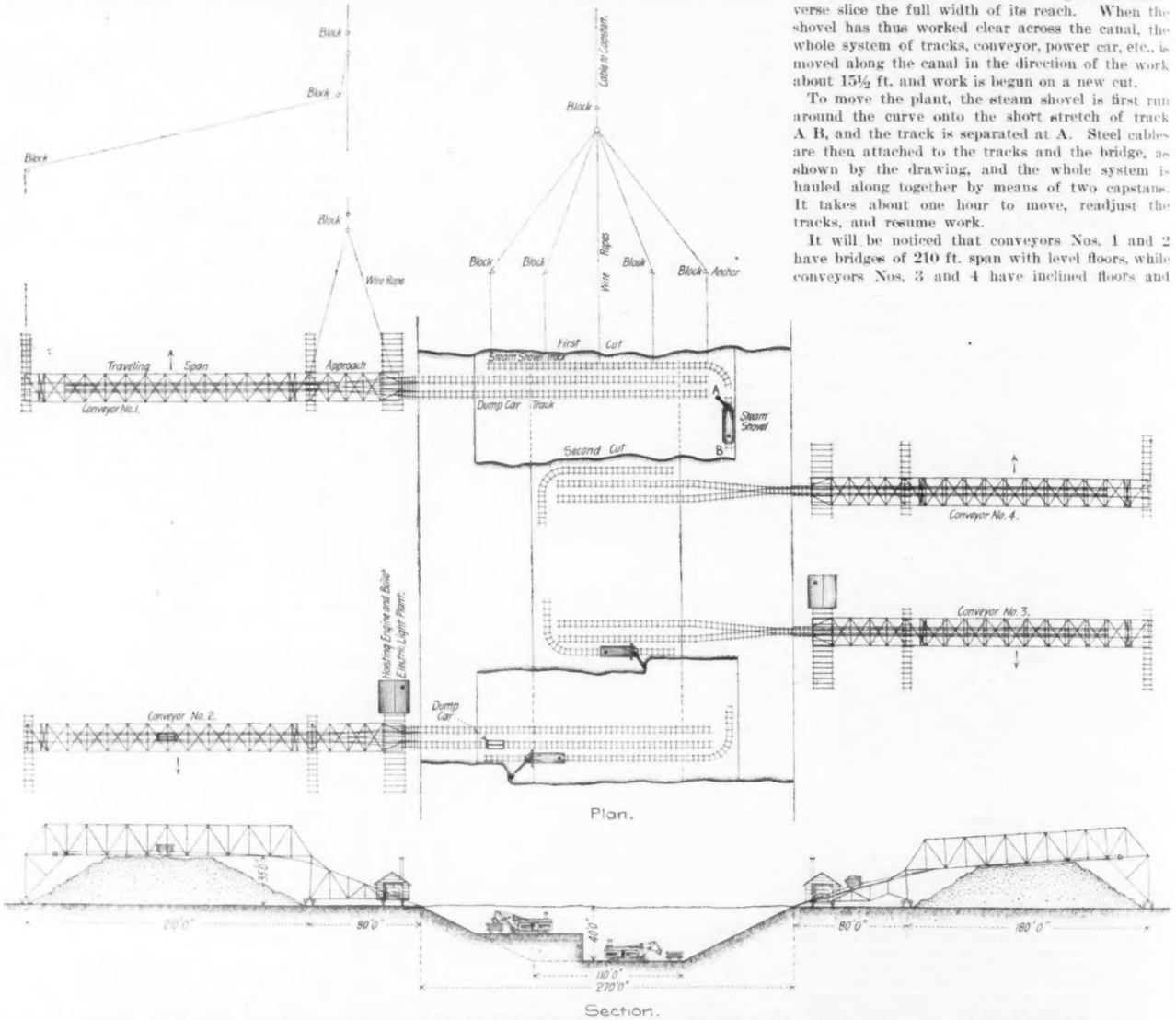


FIG. 1. PLAN AND SECTION SHOWING ARRANGEMENT AND OPERATION OF STEAM SHOVELS AND CONVEYORS.

A description of one of the conveyors will answer, with one or two exceptions in minor details, for all. Conveyors Nos. 1 and 2 are identical in construction. Each consists of a 210-ft. steel truss span, supported by a tower at one end and by the inclined approach at the other, both the tower and approach being carried on cars running on tracks parallel to the canal. Across the bridge floor is laid a track, which is continued down the inclined approach and across the bottom of the canal, in the manner shown by the drawing. These tracks are for the dump cars, which are filled by the steam shovel and hauled by cable up the incline and onto the bridge, where they are dumped, the earth falling through the floor onto the spoil bank below. The positions of the power car which operates the hoisting cable and of the steam shovel track are clearly shown by the plan. The hoisting engine is of 100 HP. and operates a 1-in. head rope for hauling the loaded car up the incline and a ¾-in. tail rope for hauling the empty car back across the bottom of the canal. Two cars are used, one being in the process of loading while the other is being dumped, the head and tail ropes being connected first to one and then to the other. The steam shovel is of the Barnhart pattern, built by the Marion Steam Shovel Co., Marion, Ohio, and has a 2½-cu. yd. dipper. As will be seen from the drawing, it works transversely across the canal, cutting out a transverse slice the full width of its reach. When the shovel has thus worked clear across the canal, the whole system of tracks, conveyor, power car, etc., is moved along the canal in the direction of the work about 15½ ft. and work is begun on a new cut.

To move the plant, the steam shovel is first run around the curve onto the short stretch of track A B, and the track is separated at A. Steel cables are then attached to the tracks and the bridge, as shown by the drawing, and the whole system is hauled along together by means of two capstans. It takes about one hour to move, readjust the tracks, and resume work.

It will be noticed that conveyors Nos. 1 and 2 have bridges of 210 ft. span with level floors, while conveyors Nos. 3 and 4 have inclined floors and spans of 180 ft. The lengths of span on each side were decided by the width allowed in the contract for the spoil bank, and the incline to the floor was given for the purpose of doing away with a tail rope for hauling the empty cars, which the longer haul of the top cut necessitated. The tail rope was necessary on conveyors 1 and 2 on account of the width of the cut; but on the second excavation the momentum gained by the car in running down the incline is sufficient to carry it across the bottom of the cut. The incline of the bridge merely insures that the car shall start back when the hoisting rope is slacked. All the bridges with their trestle approaches are made of steel and are simple in design.

Turning now to the photographs reproduced in half-tone on the inset sheet, a good idea can be obtained of the general appearance of the different conveyors and the work which they are doing. Fig. 2 shows a view of the 180-ft. span for conveyor

FIG. 5. GENERAL VIEW LOOKING DOWN THE CANAL SHOWING FIRST AND SECOND LIFTS AND PORTION OF COMPLETED CHANNEL.

FIG. 4. VIEW OF STEAM SHOVEL AT WORK ON THE SECOND CUT FOR CONVEYOR No. 3; NORTH SPOIL BANK AND CONVEYOR No. 2 IN THE DISTANCE.

EXCAVATING AND CONVEYING PLA
CHICAGO DRAINA

Designed by Christie & Lowe, Chicago, Ill.,

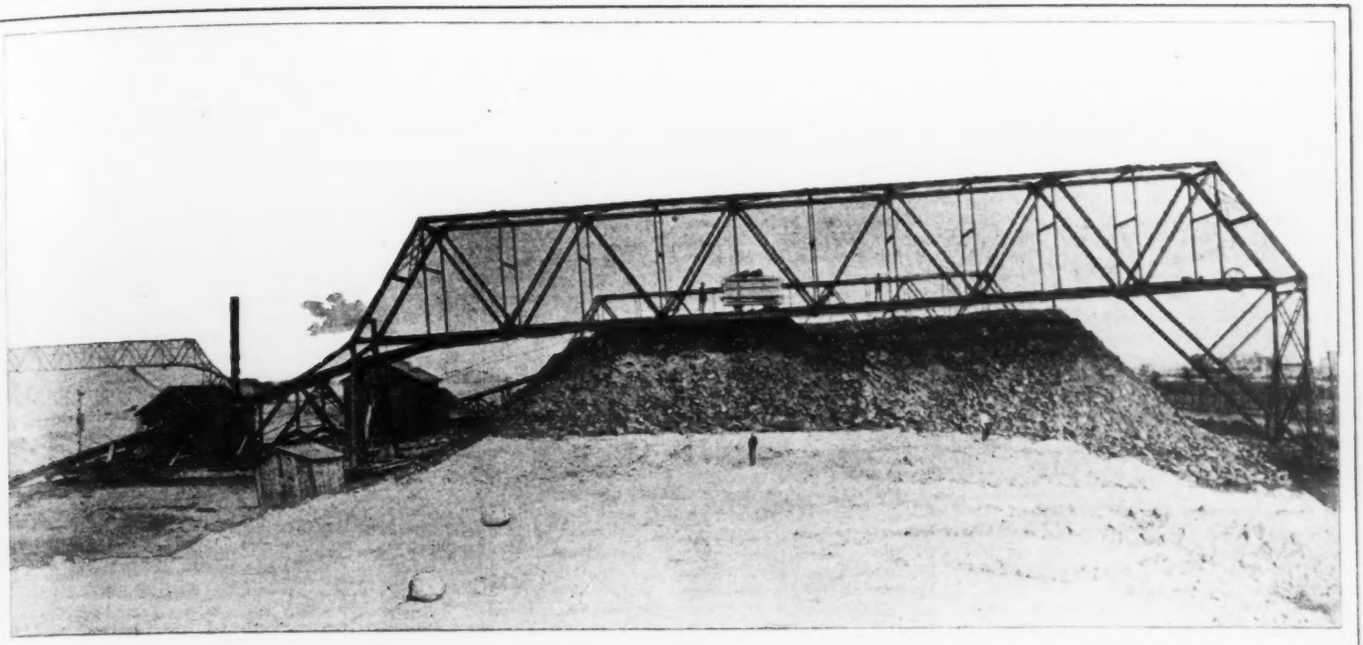


FIG. 2. VIEW OF 180 FT. SPAN AND APPROACH OF CONVEYOR No. 4,
CROSSING SOUTH SPOIL BANK.

FIG. 3. END VIEW OF 210 FT. SPAN OF CONVEYOR No. 2,
SHOWING ARRANGEMENT OF TRACKS ON APPROACH AND STEAM SHOVEL AT WORK ON FIRST CUT.

YING PLANT, ON SECTIONS I AND K,
D DRAINAGE CANAL.
hicago, Ill., Contractors for Sections I and K.

CHAS. HART & SONS, LITH., 30 VESEY ST., N. Y.

No. 4, with its incline approach and a loaded car in position for dumping. The construction of the rear tower and the car for carrying it are clearly shown, as is also the general construction of the trusses. As will be noticed, no tail rope is attached to the car here.

Fig. 3 is an end view of one of the 210-ft. spans showing the arrangement of the tracks up the slope of the canal bank and the inclined approach and also the shovel at work in the first cut. A close examination of the cut on which the shovel is working shows the tough, compact nature of the clay being excavated. The shovel is just about finishing a cut across the canal and the bottom is being leveled off ready for moving the tracks close to the bank. The plant shown is conveyor No. 2.

Fig. 4 is a view of conveyor No. 3 working on the lower cut, with the cars in position for loading. In the distance is seen the bridge for conveyor No. 2, and the spoil bank left by it. Attention is called to the generally shapely and even appearance of the spoil bank, which is just as it is left by the conveyor, no work having been done in leveling it off or smoothing it in any way. The manner in which the material breaks out at times can be seen at the left end of the cut on which the shovel is working, where a large triangular-shaped piece has broken out.

Fig. 5 is a view looking west, down the canal, showing conveyors Nos. 4 and 1 at work on the bottom and top cuts respectively. This view also shows a section of the completed canal 110 ft. wide on the bottom, 262 ft. wide at the top and 38 ft. deep. The arrangement of the two cuts and the manner in which the completed excavation is left by the shovels and conveyors are very clearly shown by this view, for it is to be noted that beyond breaking down the ends of the cuts at the slopes and slightly trimming the slopes to dimensions, no handwork has been done here and everything is just as the steam machinery has left it. The manner of draining the excavation from rainwater—there being no seepage—is also shown by this view.

The work which these conveyors are doing has been very satisfactory, considering the nature of the material in which they are working. The average output of each plant is stated by the contractors to be 65 cu. yds. per hour, which, as work is carried on night and day, makes the total output of the entire plant about 6,200 cu. yds. every 24 hours. On some days the output has been very much more than this, but in these cases the conditions were especially favorable and it is not claimed that more than 65 cu. yds. per hour can be depended upon for each plant in regular work day after day. The cars used hold 9 cu. yds. even full, and require only one man on the bridge who alone dumps them and keeps the track and cables clear of dirt, and, in fact, attends to the whole work on the spoil bank. The small number of men employed is one of the principal claims made in favor of these conveyors. Among the other claims made by the contractors is that the bridge makes the best possible dumping platform; the haul to the spoil bank is the shortest possible, thus requiring a minimum length of tracks; only two cars are used, and the canal is finished as the work progresses. About 700 ft. of canal is now being completed each month by the entire plant.

We are indebted to the contractors, Christie & Lowe, of Chicago, for the matter from which our illustrations have been prepared. Mr. Geo. A. Lederle, of that firm, is in direct charge of the work on the ground.

EXPERIENCE WITH SOLID METAL BRIDGE FLOORING.

By Geo. B. Francis,* M. Am. Soc. C. E.

One of the most typical cases of the application of solid metal bridge flooring is shown in the article on the "Archer Ave. Subway, Chicago, Ill.," in Engineering News of Oct. 11. In this bridge the question of ballast, style of floor and drainage all received consideration, and the result is a finished design, whatever may be said of the final settlement of each question.

Three matters of prime importance in connection with bridge floors are being brought to the front very rapidly, and engineers will be obliged to give serious attention to them, whether they wish to or not.

1. City ordinances and court decrees are going to specify "solid metal, water-tight, ballast floors" wherever tracks are to be carried over busy city or village streets. Solid metal, because timber is inefficient; water-tight, because of the drip nuisance, and ballast floors to reduce noise to a minimum. 2. Such a provision is incomplete without a carefully-devised system of drainage gutters and conductors. 3. Such a solid floor must be selected as will suit the individual case. For instance, if the bridge is a through girder bridge, such a floor as that used for the Archer Ave. Bridge is all right, provided an engineer can satisfy himself that the four continuous joints in the bottom of each trough, to which water has access, are going to prove water-tight after some time in service or after the expense of caulking or other treatment to make them so has been borne.

If the bridge in question is to be a deck girder bridge, with the floor shapes on top of the girders, it would seem that a rectangular-shaped floor, like the one used at Archer Ave., is out of the question. In other words, the floor shapes as used there are strictly for a floor that is hung in some manner; and for deck flooring, a shape with flat tops and bottoms and inclined sides would be more suitable. The rectangular shape resting on its base has a tendency to deform when loaded; from this tendency the flooring with inclined sides is free.

It is also perfectly feasible to use the latter flooring in place of the rectangular flooring where the bridge must be made with through girders, either by resting the flooring directly on the bottom flange of the girder or by cutting short the bottom member and resting the flooring on clips or shelf angles under the top member, taking the drainage water exactly as provided for in the Archer Ave. Bridge. If the flooring rests on the bottom flange, a drainage hole should be punched in the shapes to take the water clear of the flange, and in this case standing water can be kept off the bottom flange better than would be done in the Archer Ave. Bridge with ballast.

It would seem that a floor with the bottom member made up in one piece, trough shape, would be more liable to give satisfaction for conveying water than one which has joints in the base, or which allows a ballast load in the trough to pull on the rivet heads, to say nothing of a saving in bottom flange metal and general economy due to sloping sides. It cannot be denied, however, that floors of excessive depth, say, about 16 ins., suitable for double track width, can be better made up of vertical webs; but it is questionable if excessively deep floors are desirable on the whole.

In cases where it is deemed necessary to fill the troughs with some ballast, either for the purpose of deadening the noise or so that the regular track force may keep up the track, or possibly for the purpose of lessening rigidity under the rail, it would also seem that the thickness of floor can approach more nearly to the minimum with floor troughs having sloping sides, allowing the ties to lie to some extent in the troughs, though not so deeply as to prevent tamping.

The V-shaped floor appears to be neither suitable for deck work nor for a hung floor, but finds its best application midway between these extremes, and is therefore not so frequently applicable. It makes a good floor, except that it is not so easy to drain and requires greater depth than other types. The ordinary buckle plates, used either side up, seem to be difficult of easy provision for drainage, and are better for use in floors of buildings than in bridges; in fact, they are not readily made into water conveyors.

In small bridges whose floor area does not exceed 500 sq. ft. it may be safe to rely on a crowned sheet of asphalt to shed the surface water entirely off the bridge before it reaches the trough shapes; but several trials of this method have proved ineffectual, the asphalt breaking into irregular areas and seams opening in it, permitting water to pass to the metal.

Wherever floor shapes are used on top of girders it is best not to try to butt the shapes on the girders, but to let them run over the edge of the flanges and thereby provide an open end over a readily attached gutter, and if the shapes are to continue longitudinal with the troughs, lap the next set on the first set.

One of the most serious difficulties found in making up trough flooring with inclined sides, where the trough members are alternately inverted, is in spacing the troughs accurately center to center to meet connections provided on the girders. This can be readily overcome, however, if the top member of the flooring is made in the form of a cap plate, a provision now largely adopted.

The fastening of deck flooring to the tops of girders can be done in many ways without leaving rivet holes in the flanges of the girders themselves, sometimes by attaching to web stiffeners, and at others to brace frames, etc.

It is not believed that pure theory alone can determine what form of flooring is most adaptable to the various conditions, but that experience and service are necessary to show what forms will best meet the requirements, just the same as experience develops many another implement.

The nature of a pavement under a bridge has quite as much to do with the noise as the bridge itself; and to get the most satisfactory results experience shows that a noiseless pavement, like asphalt, is absolutely necessary.

There is such a thing as trying to use a metal flooring in the wrong place. It is questionable if it is proper to use it for bridge floors for highways over railways, where the drip from the floor is not much of a nuisance and where the gases from the locomotives must surely be injurious to the metal. It is quite as easy to get a good highway or street surface over a plank flooring as over a metal floor, if macadam, asphalt, or paving is laid. It is also quite as easy to make a ballast floor bridge with proper drainage holes, etc., over a stream, without the use of a solid metal floor, provided the trusses or girders are designed to sustain the ballast floor; and it is doubtful if the metal floor for supporting ballast in such places is much more economical than timber, properly treated. For railway bridges over streets in cities and towns, however, the "solid metal ballast floor, water-tight" bridge has come to stay, and it must finally do all that is required of it.

* Resident Engineer, New York, Providence & Boston and Old Colony R. R. Terminal Co., Providence, R. I.

THE FOUR NEW RESERVOIRS FOR THE WATER-WORKS OF PORTLAND, ORE.

By Jas. D. Schuyler, M. Am. Soc. C. E.*

Four reservoirs are now being constructed at Portland, Ore., as a part of the new water-supply system. They are for high and low service, and are located on each side of the Willamette River. Their capacities, elevations and locations are as follows:

No.	Capacity, gallons.	Elevation, ft.	Location.
1	14,000,000	400	East Portland.
2	22,000,000	220	" "
3	16,000,000	250	City Park, west side
4	18,000,000	220	" "

Reservoirs Nos. 1, 3 and 4 have dams of concrete 35, 60 and 50 ft. high, respectively, 200 to 300 ft. in length. Reservoir No. 2 is excavated from comparatively level ground, with a low embankment on three sides, 1 to 14 ft. high. Some 30,000 cu. yds. of concrete were put in place during 90 days, a maximum of 660 cu. yds. per day having been reached. Reservoirs Nos. 3 and 4 are lined with concrete 5 to 6 ins. thick, with ¾-in. square twisted rods every 2 ft. in each direction, bedded into the concrete, the rods passing through the eyes of vertical anchor posts of iron bedded in concrete, placed in 7-in. round holes, 3 to 20 ft. deep, every 10 feet, the surfaces being coated afterward with California asphalt. This novel construction is much admired, for its evident adaptability to the situation and soil. In reservoir No. 4 a clay puddle, made of clay and fine gravel ground together, is placed over the entire surface, to a depth of 6 ins., before the concrete is applied. On reservoirs Nos. 3 and 4 the banks were streaming with springs, all of which were piped out through the dam under the lining. Tile drains, 10 ft. apart, were placed from top to bottom on slopes all the way around the reservoirs. These lead to iron pipes at the foot of the slope. Reservoir No. 2 is lined with vitrified brick, in two courses, laid in paving pitch, and coated with asphalt and sand. Special arrangements have been made at the gate houses for measuring and handling the water while cleaning the reservoirs, without interfering with flow

* The reservoirs described were designed and are being constructed by Mr. Schuyler.—Ed.

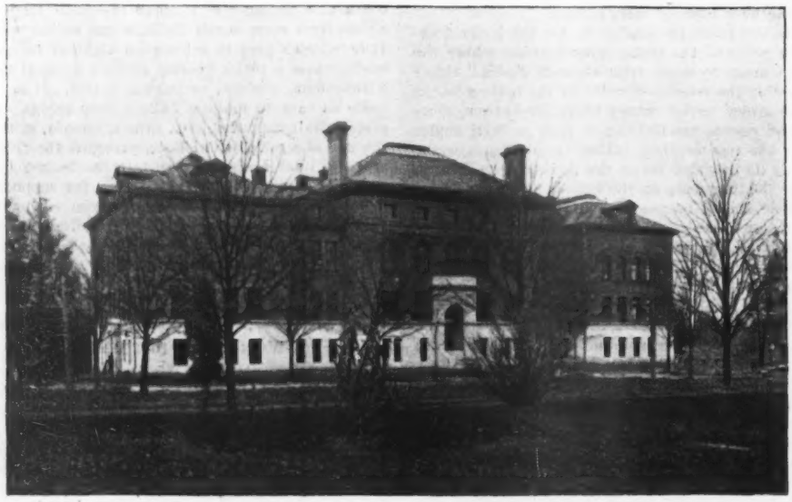
in the gravity main, which brings the water from Mt. Hood. The reservoirs have cost about $400,000, and the entire works about $2,200,000.

The water power is to be utilized for electric lighting and pumping to Portland Heights. At reservoir No. 2 there will be 115 HP. net, and at No. 4, 127 HP., derived from the water falling from the high service to the low-service reservoirs. Pelton water wheels have been ordered for the power plant at reservoir No. 4, and two Riedler pumps, one to pump 1,000,000 gallons daily 300 ft. high, the other 500,000 gallons to a height of 600 ft. above reservoir No. 3, or to 800 ft. elevation above city base. Smaller reservoirs are to be constructed at these higher levels.

THE NEW ENGINEERING BUILDING AT THE UNIVERSITY OF ILLINOIS.

The date of this issue of Engineering News is that set for the dedication of the new Engineering Building at the University of Illinois, and we show herewith a perspective view of the building, reproduced from a photograph.

The University of Illinois is located between the contiguous cities of Champaign and Urbana. Compared with other state universities, it is young. Its growth and development may nearly be said to be a state secret. It was founded in 1868 on the proceeds of the land grant. In harmony with the avowed purposes of the United States law endowing



THE NEW ENGINEERING BUILDING AT THE UNIVERSITY OF ILLINOIS.
G. W. Bullard, Architect.

it, the institution was first called the Illinois Industrial University. The word "industrial" led the public to believe that the university was some sort of a penal or reformatory institution. It was not until 1885 that the legislature consented to authorize the use of the name University of Illinois.

With the change of name, the state legislature seems to have assumed a new attitude toward the university, and in the last few years it has made a vigorous growth. At present there are 70 in the instructing force, and there are practically 800 students, of whom nearly 500 are pursuing engineering courses. The growth of the College of Engineering has been rapid, the number of students having doubled in the past five years. The claim is made that only three institutions in the United States have more engineering students than has the University of Illinois. The word "engineering" is used to include architecture, and the school of architecture is said to be the largest in the country.

The new Engineering Building has a front of 200 ft., with wings at either end 76 ft. deep, while the central portion extends back 140 ft. It is four stories in height. The first story is of Cleveland sandstone and the remaining stories are of buff pressed brick with terra cotta trimmings. The roof is of slate with large skylights. The mill system of slow-burning construction is employed throughout. Plate glass windows and Washington fir and polished oak, with other finishings in keeping, make the interior very attractive. Steam heat, mechanical ventilation, and gas and electric lights will be used.

In planning the building much study has been given to the problem of arranging the rooms in the manner most convenient for the purposes of instruction. Lecture rooms, drafting rooms, seminary rooms, studios, offices, cabinet and filing rooms and library have all been carefully planned for their especial purposes. The furniture also has been designed to meet the requirements of modern engineering instruction. Large space has been given to cabinet and wall cases, and ample provision has been made for filing pamphlets, drawings, photographs, models, specimens, etc.

The building was designed by a graduate of the school of architecture, Mr. G. W. Bullard, of the class of '83, now of Tacoma, Washington. The design was selected by a competition, open only to graduates of the school of architecture of the university. The total cost of the building was $160,000.

The building is devoted exclusively to technical instruction in civil, electrical, mechanical and municipal engineering and architecture. The masonry laboratory of the department of civil engineering occupies two large rooms in this building. The laboratories of mechanical engineering, electrical engineering and applied mechanics are in other buildings.

Simultaneously with the dedication of the new building a new president will be installed, Dr. Andrew S. Draper, recently Superintendent of Public Instruction of the State of New York, having been selected for the post by the trustees. The programme of exercises at the dedication of the new building includes addresses by President Adams, of the University of Wisconsin; D. H. Burnham, of Chicago, late Director of Works of the Columbian Exposition, and the President of the American Institute of Architects, and Gen. William Sooy Smith, M. Am. Soc. C. E., of Chicago.

The reputation which the university has won in the past has been due to its able teaching force. Its success is a good illustration of the saying that it is men, not buildings, that make a university. Prof. I. O. Baker, head of the department of civil engineering, has won an enviable reputation among engineers in active practice by his numerous and valuable contributions to technical literature, many of which have been made through the columns of this journal. There are few professors of engineering who keep in closer touch with the practical side of the profession; and his many friends will be glad to hear that the engineering department of the institution which he has done so much to build up is now provided with a home worthy of the work it is doing. While Professor Baker's name is probably better known to the readers of this journal than that of the other members of the engineering faculty, the list of those in charge of the other departments includes a number who have won prominence by their work. Mr. N. Clifford Ricker, Fellow of the American Institute of Architects, is Dean of the School and Professor of Architecture; Mr. A. N. Talbot, M. Am. Soc. C. E., is Professor of Municipal Engineering; Mr. D. W. Shea, Ph. D., is Professor of Electrical Engineering, and Mr. L. P. Breckinridge, M. Am. Soc. M. E., is Professor of Mechanical Engineering.

THE VALUE OF BRANCH LINES OF RAILWAY.*

In the "Annales des Ponts et Chaussees," for February and March, 1892, Mr. Considere published an elaborate investigation on this subject, in order to ascertain how far the State, representing the interests of the general community and the main lines of railway, is interested in the construction of branches that might not be remunerative in themselves, and also to determine, with regard to such branches, on what terms they should be worked so as to conciliate the interest of the lessee with that of the public. In the same journal Mr. Colson published, in November, 1892, a criticism of Mr. Considere's arguments, and the present article is a reply to Mr. Colson's criticisms.

One of the most important of the propositions enunciated in the former articles was to the effect that (in France) branch lines of purely local interest contribute, on the average, to the main lines' gross receipts 1.4 times greater than those which they themselves earn. This conclusion was arrived at by an analysis of the statistics of traffic from the stations of nine branch lines. Allowance was made for the traffic which would in any case have reached the main line by highway even if the branch had not existed. This proposition having been questioned by Mr. Colson, an analysis is now presented of seven other branch lines which leads to the same result. It is found that the mean distance travelled by both passengers and goods to or from stations on a branch line is the same as for stations on the main lines similarly situated, i. e., being of about the same importance and at equal distance from the principal centers of business of the region. For the 16 branches examined, it is found that the total distance travelled is, on the average, 19 miles for passengers and 81 miles for goods, while the distance travelled on the branch is seven miles for passengers and 13 for goods, the length of the branches being from 13 to 16 miles. The rates for passengers are, on the average, 1.68 cts. per mile on branches and 1.44 cts. on main lines, while those for goods are 2.52 cts. per ton per mile on branches and 1.86 cts. on main lines. These figures lead to the ratio of receipts given above.

The author admits that a great deal of the new traffic created by branch lines might have been profitably carried on without them, since it is far greater than the mere saving of cost in a few miles of transport can account for, and he attributes this result to the fact that a railway introduced in a new district acts as a general stimulus to enterprise and as an advertisement, and thus leads to a great deal of business being undertaken, which might before have been profitably carried on if only the opportunities had been recognized.

On the questions of the profit made from a new railway by its actual customers and the indirect gains by those who do not actually use it, Mr. Considere maintains his formerly expressed opinions and supports them by fresh considerations. He accepts an estimate by Mr. Picard that one-third of the total increase of national wealth in France during the past 30 years is due to the railways, and from this deduces that the indirect annual gain to the country from the general railway system is three times the gross receipts of the railways. For the branch lines he reduces this ratio to 2, having estimated it at 2½ in his former papers. A table is given on these bases, showing the results of constructing branch lines costing $15,000 per mile and worked at a cost of 50% of their gross earnings, plus a fixed charge of $315 per mile. Thus a line earning $300 per mile per annum only loses on its working $165 per mile per annum, but it contributes 70% of $300, or $210 of net profit to the main line, and 4.8 times $300, or $1,380 of profit to the general public, so that on the whole the community would gain a profit of $1,440 per mile from the working of the line, or nearly 10 per cent. on its cost. Of course the exact ratios here given are largely hypothetical and incapable of being exactly ascertained.

It is pointed out that the indirect gains which figure here so prominently are lost to the country when capital is invested in foreign instead of in home railways. The author finds support for his views in the fact that the Conseil d'Etat submitted a railway bill to Parliament in January, 1892, in which a clause occurs that in no case shall the subventions of the State and local authorities be applied to cover a deficiency on working greater than $235 per mile per annum, which would imply that up to that limit the construction of new lines might properly be supported out of the public purse.

* Abstracts of foreign publications, Minutes of Proceedings Inst. C. E.

This article is followed by a note in reply to it by Mr. Colson, in which he adheres to his opinions formerly expressed. He thinks that statistics are incapable of furnishing information which can be a reliable guide as to the advantage to be gained from a new railway outside its own gains, because the local conditions vary so greatly as to destroy the value of averages and because of the uncertainty of many of the hypotheses adopted. He thinks that Mr. Considere has neglected to consider the disadvantages arising from making good the deficits of railways from general taxation, and that tariffs ought never to be lowered beyond the point at which they cover the working expenses, except when such reductions would give rise to a large and useful business that could not otherwise exist.

SOLID FLOOR FOR GASPEE AND PROMENADE ST. BRIDGES, PROVIDENCE, R. I.

In our issue of July 26 we illustrated the solid, metal-trough floor which is being used on the Gaspee and Promenade St. bridges being erected at the

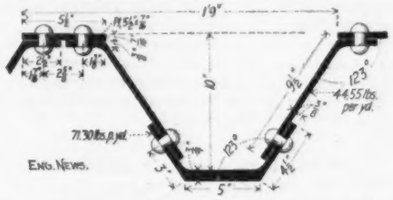


Fig. 1. Transverse Section of Metal Trough Bridge Floor; Designed by Messrs. Geo. B. Francis and E. P. Dawley.

new terminal station in Providence, R. I. This floor was designed and has been patented by Messrs. Geo. B. Francis, M. Am. Soc. C. E., and E. P. Dawley, M. Am. Soc. C. E., respectively, Resident Engineer and Division Engineer on the work, and differs somewhat from previous designs, as will be seen from Fig. 1, shown herewith. For a more complete description of the design and the advantages claimed for it, reference may be made to the article in the above-named issue. In connection with this description the accompanying views of the floor for the Gaspee St. bridge, reproduced from photographs sent us by Mr. Dawley, will be of interest. Fig. 2 is a general view of the floor, looking transversely across the bridge, and Fig. 3 is a somewhat closer view, showing one of the sections of flooring just ready to be lowered into place, and indicating quite clearly the method of construction. The illustrations explain themselves and need no further description. The contractors for the ironwork were the Berlin Iron Bridge Co., of East Berlin, Conn.

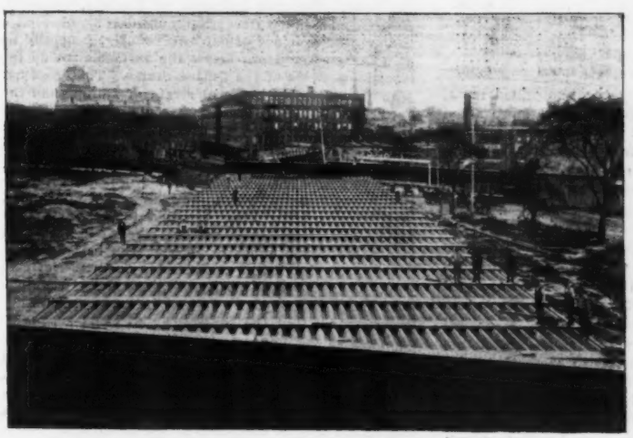


FIG 2. VIEW OF SOLID FLOOR FOR GASPEE ST. BRIDGE, PROVIDENCE, R. I. Berlin Iron Bridge Co., East Berlin, Conn., Builders.

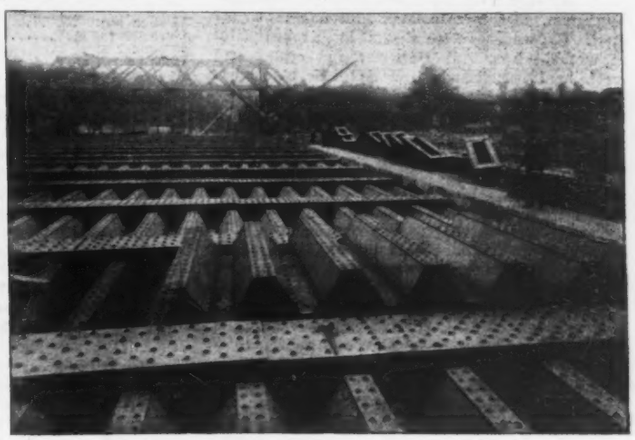


FIG. 3 ENLARGED VIEW SHOWING CONSTRUCTION OF SOLID FLOOR FOR GASPEE ST. BRIDGE, PROVIDENCE, R. I.

THE REPORT OF THE CHICAGO STRIKE COMMISSION.

It is just four months ago that this country experienced the greatest and most widespread labor disturbance that has ever visited it. The problems which were then forced so strongly upon the public attention are still with us unsolved, and there are no problems in connection with industrial life which more earnestly demand the attention of thoughtful men. The report is made public this week of the able commission which was appointed by the President to investigate the strike, and it deserves careful study and consideration. The full text of the report will be available to our readers through the columns of the daily press; but as a matter of record we print herewith the recommendations with which the commission concludes its report:

I.

(1) That there be a permanent United States strike commission of three members, with duties and powers of investigation and recommendation as to disputes between railroads and their employees similar to those vested in the Interstate Commerce Commission as to rates, etc.

(a) That, as in the interstate commerce act, power be given to the United States courts to compel railroads to obey the decisions of the commission, after summary hearing unattended by technicalities, and that no delay in obeying the decisions of the commission be allowed pending appeals.

(b) That, whenever the parties to a controversy in a matter within the jurisdiction of the commission are one or more railroads upon one side and one or more national trade unions, incorporated under chapter 567 of the United States Statutes of 1885-'86, or under state statutes, upon the other, each side shall have the right to select a representative, who shall be appointed by the President to serve as a temporary member of the commission in hearing, adjusting and determining that particular controversy.

(This provision would make it for the interest of labor organizations to incorporate under the law and to make the commission a practical board of conciliation. It would also tend to create confidence in the commission, and to give to that body in every hearing the benefit of practical knowledge of the situation upon both sides.)

(c) That, during the pendency of a proceeding before the commission inaugurated by national trade unions, or by an incorporation of employees, it shall not be lawful for the railroads to discharge employes belonging thereto except for inefficiency, violation of law, or neglect of duty; nor for such unions or incorporation during such pendency to order, unite in, aid, or abet strikes or boycotts against the railroads complained of; nor, for a period of six months after a decision, for such railroads to discharge any such employes in whose places others shall be employed, except for the causes aforesaid; nor for any such employees during a like period, to quit the service without giving 30 days' written notice of intention to do so, nor for any such union or incorporation to order, counsel or advise otherwise

(2) That chapter 567 of the United States Statutes of 1885-'86 be amended so as to require national trade unions to provide in their articles of incorporation, and in their constitutions, rules and by-laws that a member shall cease to be such and forfeit all rights and privileges conferred on him by law as such by participation in or by instigating force or violence against persons or property during strikes or boycotts, or by seeking to prevent others from working through violence, threats or intimidations; also, that members shall be no more personally liable for corporate acts than are stockholders in corporations.

(3) The commission does not feel warranted, with the study it has been able to give to the subject, to recommend positively the establishment of a license system by which all the higher employes or others of railroads engaged in interstate commerce should be licensed after due and proper examination, but it would recommend, and most urgently, that this subject be carefully and fully considered by the proper committee of Congress. Many railroad employes and some railroad officials examined and many others who have filed their suggestions in writing with the commission are in favor of some such system. It involves too many complications, however, for the commission to decide upon the exact plan, if any, which should be adopted.

II.

(1) The commission would suggest the consideration by the states of the adoption of some system of conciliation and arbitration like that, for instance, in use in the commonwealth of Massachusetts. That system might be reinforced by additional provisions giving the board of arbitration more power to investigate all strikes, whether requested so to do or not, and the question might be considered as to giving labor organizations a standing before the law, as heretofore suggested for national trade unions.

(2) Contracts requiring men to agree not to join labor organizations, or to leave them, as conditions of employment, should be made illegal, as is already done in some of our states.

III.

(1) The commission urges employers to recognise labor organizations; that such organizations be dealt with through representatives, with special reference to conciliation and arbitration when difficulties are threatened or arise. It is satisfied that employers should come in closer touch with labor and should recognize that, while the interests of labor and capital are not identical, they are reciprocal.

(2) The commission is satisfied that if employers everywhere will endeavor to act in concert with labor; that if when wages can be raised under economic conditions they be raised voluntarily, and that if when there are reductions, reasons be given for the reduction, much friction can be avoided. It is also satisfied that if employers would consider employees as thoroughly essential to industrial success as capital, and thus take labor into consultation at proper times, much of the severity of strikes can be tempered and their number reduced.

THE RIEHLE STRAIN DIAGRAM RECORDER FOR TESTING MACHINES.

A few years ago a testing machine which gave an automatic diagram of the distortion of a specimen placed in it was a novelty. Now appliances for obtaining such diagrams are generally demanded by purchasers of testing machines. The Riehle Testing Machine Co., of Philadelphia, has just completed some improvements in devices for automatically recording the stretch of specimens, which it claims to be especially convenient for the operator and accurate in use. The mechanism is described as follows: The testing machine having been adjusted to suit the specimen in question, a strain card is placed on the drum cylinder at head of the beam and a telescopic extensometer is attached firmly to the specimen by means of the adjusting screw, but so that it will follow the elongation by its telescopic slides. A fine piano wire is then used

to revolve the drum and is carried across over suitable guide pulleys to the extensometer, the points of which are, say, 8 ins. apart. In order to multiply the actual elongation, a series of small guide pulleys are mounted on pins the same distance apart as the points of the extensometer screws, so that the wire can be rove over the pulleys as many times as it is desirable to magnify the stretch.

With everything adjusted at zero, the machine is started up, and as the load is applied and the beam rises, an electric circuit is made, which, by means of a magnet and friction clutch, causes a grooved wheel to communicate its motion to the hand wheel controlling the weighing mechanism. A simple arrangement of two disks at right angles to each other enables the operator to control both the speed and direction of the weighing poise.

THE EFFECT OF STRESS ON THE CORROSION OF METALS.

At a recent meeting of the Institution of Civil Engineers, Mr. Thomas Andrews presented a paper on the above interesting subject, detailing his methods and the results obtained. The important subject of corrosion has hardly received the attention it deserves from either engineers or metallurgists. In 1892 Mr. David Phillips and Dr. A. Crum Brown contributed several valuable papers upon the corrosion of metals to the Edinburgh meeting of the British Association for the Advancement of Science, and Mr. Andrews himself has already presented his views upon the galvanic aspect of the corrosion of metals in sea water in a paper read before the Institution.

The object of the present research of Mr. Andrews was to investigate the influence of physical strain on the corrosion of metals. In most engineering and naval structures, the metal used is necessarily more or less in a condition of variable stress during its service, and it occurred to the author that the ordinary rates of corrosion might possibly vary, even in the same piece of metal, with the stress imposed upon the material.

Mr. Andrews includes in his experiments iron and steel, mostly selected from his own standard samples. The specimens tested were large rolled, wrought iron bars, wrought iron hammered shafts, Bessemer and open-hearth forged steel shafts, and large bars of soft and hard Bessemer steel, soft and hard open-hearth steel, soft and hard cast steel, and aluminum, nickel, chromium, silicon and copper steel. Experiments were also made on rolled plates of wrought iron, soft Bessemer and open-hearth steel, hard open-hearth steel and soft cast steel. The chemical composition and general physical properties of these specimen metals are fully set forth in tabular form in the original paper.

The various metals were prepared in the form of bars 3⅛ and 3¼ ins. diameter, and some were forged shafts 4⅜ ins. and up to 5½ ins. in diameter. The plates used were 5-32 in. thick and 3 ft. square, either used flat or bent in the form of a semi-cylinder. In all the experiments the metals were perfectly bright when submitted to test. The observations were divided under the three following heads. Influence of tensile stress on corrosion, influence of torsional stress on the corrosion of metals in sea water, influence of bending stress on corrosion.

The author estimated the relative corrosion of the "strained" and "unstrained" portions of the same metals by the galvanic method which he introduced some years ago with satisfactory results in his previous researches on the corrosion of metals. By means of the exceedingly sensitive galvanometer the slightest variation in the relative rate of corrosion between any two metals, immersed in an electrolyte, can be ascertained. In observing the influence of tensile stress upon the corrosibility of iron and steel bars, the following method was pursued:

From each metal under investigation a bar was cut and turned into a test piece 6 ins long, 3 ins. between heads, ¾ in. in diameter for this 3 ins. and 1 in. and 1½ ins. in diameter for the heads, each ¾ in. long. This bar was then submitted to a stress usually sufficient to produce an elongation of 20% between gage points 3 ins. apart. After being strained, the piece was cut in two at the center, and both halves were turned down to exactly the same dimensions. In one piece the "strained" end coincided with the middle of the test bar, and was left untouched in the lathe up to the point where there was any reduction in diameter, caused by the tensile stress. In the second half, the end corresponding to the "strained" end of the first half was turned out of the head of the test bar, and this end thus consisted of "unstrained" metal, or at least of metal considerably less under the influence of stress than the end of the first half.

These two halves, exactly alike in form, were then immersed, as a galvanic couple, in a saturated solution of sodium chloride, and sometimes in sea water. They were held in position in the beaker by insertion through two holes in a plate of thick glass, with the tapered ends only immersed to a depth of about ¾ in. in the solution. Galvanic contact between the two pieces of metal was only made momentarily at the time of reading the galvanometer, and the difference of potential between the "strained" and "unstrained" metals was thus observed. The terminals of the bars were connected with a delicate galvanometer, placed in circuit, with results fully tabulated in the paper of Mr. Andrews for each set of experiments. A sensible current was observed between the two bars, and the "unstrained" end was found to be in the electro-positive position, answering to the zinc in a galvanic couple. This indicated that the "unstrained" metal was being more rapidly acted upon by the solution, and was thus corroding more rapidly than the "strained" metal.

The other observations were made by similar methods, and, without going into all the details, the general results are given as follows: In the test to determine the effect of tensile stress on corrosion it was found that an average electromotive force of 0.016 volts obtained between the strained and unstrained parts of the test bar under the conditions recorded. Under similar conditions the metal named gave the following electromotive force for the several tests:

	Tensile, in bars. Volts.	Torsional, portions of forged shafting. Volts.	Flexional, in plates. Volts.
Aluminum steel	0.004	0.003	....
Soft Bessemer steel	0.019	0.019	0.014
Hard " "	0.006	0.006	0.017
Soft cast steel	0.003	0.005	0.005
Hard cast steel	0.003	0.035	....
Silicon steel	0.004	0.005	....
Aluminum steel	0.004	0.003	....
Nickel steel	0.003	0.020	.....
Rolled wrought iron bars	0.002	0.013	0.012
Soft open-hearth steel	0.005	.....	0.005
Hard open-hearth steel	0.005	.....	0.006
Copper steel	0.006	0.017	.....
Chromium steel	0.001	.....	.....
Bessemer steel hammered	0.011	0.007	.....
Open-hearth steel "	0.006	0.027	.....
Average force	0.016	0.018	0.010

In all of these experiments the unstrained metal was in the electro-positive position and more acted upon by the electrolyte than the "strained" portion. This was true in the tests for influence by tension, torsion and flexure. The electromotive force observed in the respective instances is only an approximative, and not an absolute, measurement for the various materials. It may be surmised that the extent of the galvanic current set up from the causes referred to, and the consequent rate of corrosion, will vary according to the extent of the stress to which the metal is subjected. The electric measurements should be taken as establishing a general principle rather than as absolute measurements for purposes of accurate comparison of the behavior of the various metals.

Mr. Andrews arrived at the following conclusion: That wrought iron and various steels, when exposed singly and separately, and without liability to galvanic action other than local, to the action of sea water for long periods, showed a greater corrosion on the part of all the steels than in the wrought iron. The advantage in favor of wrought iron was, roughly, 25% and upwards, as compared with the steels. It was also noticed that corrosion increased in the steel as the percentage of combined carbon was greater.

He also found that galvanic action between wrought iron and steel induced a largely increased total corrosion in the several metals. In tidal streams he found that the upper and lower portions of a metal structure, though composed throughout of the same metal, were exposed to electrolytic disintegration from the galvanic action set up by solutions of different salinity on the metal, the difference being due to the gradual rise and inward flow of salt water and the outward flow of fresh water. The author had already shown, in a previous paper, that there are indications that magnetic influence tends to increase the corrosion in steel.

To this is now added the additional information that stress considerably affects the rate of corrosion; and, contrary to expectation, it is the "unstrained" metal that is most liable to corrosion. In a previous paper, on the influence of stress on railway axles, the author attempted to show that stress of any kind alters the physical properties of iron and steel. Stress increases the rigidity of both, renders the metal harder and greatly reduces its properties of elongation or ductility. The same demonstration would apply to the corrosion tests; the strained metals were rendered harder in nature, and hence were less liable to corrosion in this strained condition than in the normal softer condition. The experiments indicate, however, that an increased total corrosion, in excess of the normal corrosibility of the metal, occurs from the action of the local galvanic currents which are shown to be induced between "strained" and "unstrained" portions of even the same iron or steel forging, bar or plate. Hence, a strain occurring in a metallic structure tends, owing to the local galvanic action thus set up, to increase any corrosion forces which may deteriorate the metal of which it is composed.

WASTE OF COAL IN MINING.*

By Selwyn M. Taylor.

My material and theories for the construction of a paper on the waste of coal in mining are mainly from my experience in the Pittsburg coal bed, but what applies to the Pittsburg coal bed will apply, with but very slight variations, to all the bituminous measures in the United States, from the Alleghenies to the Rocky Mountains. Theoretically, there is no obstacle in the mining and removing of all our approximately horizontal coal veins, and, practically, this is the case, excepting such loss as is caused by accident, tradition, and careless management. The Pittsburg coal seam, probably the most valuable in the world by reason of its extent and valued characteristics, has an average thickness of from 12 to 14 ft., but of this only from 5 to 9 ft. is commercially valuable, the remaining portions of the vein being so interspersed with strata of slate as to render them worthless. Therefore, the thickness of the coal, as the term is commonly used, is from 5 to 9 ft. The Freeport veins of coal in the lower coal series, mined extensively in northern and central Pennsylvania and Ohio, vary from 2 to 9 ft. in thickness. The coal measures of England, Germany, Belgium and other European countries, together with the anthracite mines of our own country, generally lie at a far greater depth below the surface than do the bituminous fields of the United States. This, together with the fact that the coal strata of Europe and the anthracite measures of Pennsylvania are generally of a deep pitch, varying from 20° to 60°, cause to be left in the mine from 20 to 60% of their entire coal areas in order to support the overlying strata, and thus prevent the squeezes, or crushes, which would probably cause the loss of an entire mine plant. The larger part of this coal is absolutely lost. From the fact that many of our miners and mine bosses received their education and prejudices in the mines of Europe, can be traced the cause of the leaving of considerable quantities of coal where there has been no necessity for doing so in our own fields in the past. It has, however, been fully demonstrated that the surest way to avoid a squeeze or crush in our mines is to mine the coal as rapidly and systematically as possible, withdrawing all pillars and supports as fast as the system in use will permit, thus breaking the overlying strata and allowing it to fall and rest on that which is under the coal, and thus leaving no weight overhanging the remaining pillars, which must be maintained to support main entries and air-ways to the last of the mine.

Until about 15 years ago, there was little or no careful scientific mining done in this district, and few of the operators of mines knew anything of the inside of their mines, trusting the work entirely to the mine boss, who very frequently abandoned large bodies of coal because of some minor difficulty in the hauling or drainage, without the knowledge of the owner, rather than mine at an increased cost per ton, the mine boss's ability being entirely gaged by the amount of coal he could produce per diem at a minimum cost. At the present time I am working in four separate mines to recover coal wilfully abandoned under that style of management, and for one acre we recover there are 50 acres that are lost beyond all possibility of ever reclaiming them.

Without any exact figures to support my claim, ex-

*A paper read before the Engineers' Society of Western Pennsylvania.

cept those taken in cases in which I have had occasion to make careful examination. I would say that of all the coal in the Pittsburg seam mined prior to 1870, 50% of it at least was abandoned because of trifling difficulties and improper systems of mining. From that time until the present, matters have steadily improved, owing to the increased cost per acre of coal and the decreased price received by the operator for every ton of it, making economy and careful, scientific management absolutely necessary, though there are still some few operators scattered here and there throughout our immediate vicinity who adhere to old methods and cannot understand why they are running their mines at a loss.

The surveying and mapping of the mines in every detail, as required every six months, according to the Coal Mine Act of Pennsylvania, make it now practically impossible for the mine boss to wilfully abandon any coal without the knowledge of the engineer, and consequently that of the operator. In the mines I have charge of, I require every mine boss to report to me at the time of each semi-annual measurement the loss of any rooms or ribs that we may not be able to get in, and I am thus enabled to investigate the loss of any coal.

Taking one company as an example in the improvement of the amount of coal mined from a given area, in 1883 I made a complete survey of their mines, making a careful measurement and calculating the areas closely of all the unmined coal owned by the company. Deducting this from the area that had originally been owned by them, I found that they had worked over some 600 acres in 20 years, and during that time had been considered as owning one of the best set of mines in the district. Taking the amount of coal mined as shown from their books, an average production per acre was shown of 3,600 tons of lump coal. This mine, up to that time had been worked on the single entry system, a system under which nearly all the entry pillars had been left in the mine and abandoned. Changing this system as rapidly as possible to that of the double-entry system, concentrating our workings as much as possible, and adopting the system of pushing each working place to completion without delay, in the course of the next four years the mine had been brought to an average production of 4,700 tons of lump coal per acre, which has been steadily maintained, varying but a few tons each year to the present time. This amount I estimate to be about 98½% of the possible available production per acre in that thickness of coal. There being no statistics in existence showing the production per acre throughout the entire district, I can only form my estimate in a general way from such mines as I have examined and verbal statements made to me by engineers and operators. But from these I would place the average production per acre of the Pittsburg coal, that is, of coal actually shipped at the present time, to be about 85% of the entire amount. At the end of the next 10 years I hope to be able to report that fully 97% of all the coal which is under operation is being recovered and shipped.

One of the causes of waste of coal in the mines is of comparatively recent origin, that is, machine mining. It is apparently not possible to mine our coal on any other system than that of "room and pillar," with very slight modifications, the room being 21 ft. wide, leaving a 12 or 13-ft. pillar, which is, or should be, immediately withdrawn on the completion of the room. No machine has yet been invented that will mine the ribs with safety, and consequently, in machine mines after the room has been driven to its destination by machine, there is a tendency to temporarily abandon the rib, instead of starting in at once by hand mining, as should be done, simply because hand mining is a little more expensive, and the matter is put off until some time when there will be more profit in the coal. This time never comes, and a room once temporarily abandoned is very apt to be permanently so, as in a few years falls and breaks will make it absolutely impossible to revover abandoned ribs. These ribs, amounting to one-third of the coal, which, with its development in the way of tracklaying, entry driving, drainage and haulage probably stands on the books of the operator at from $600 to $1,000 per acre, is permanently lost, and in one mine alone that has been operated by machine mining for a great many years, at least 100 acres of coal has been lost in this way.

In certain sections of the Pittsburg coal district, comprising not a great many mines, a modification of the "room and pillar" system of working coal has been used for many years, and has resulted in a loss of from 20 to 30% of the entire area passed over in mining. Under this system the rooms are driven wider than usual, with the roadway in the center, and the pillars are purposely abandoned. It has been claimed for this that it prevented the upheaval of the strata under the coal, but from my experience I would say that this is not the case, and that, in addition to losing the amount of coal left in these pillars, many mines have been injured in the way of a squeeze or crush caused by their having been left.

From time immemorial it has been the custom to pay the miner for the number of tons or bushels of lump coal (that is all the coals that pass over the meshes of a 1¼-in. screen) and to pay him nothing for the finer grades that go through. This was, probably, in order to induce him to mine in as large sizes as possible, but it eventually resulted in the miner loading on his wagon nothing that he could help but the large coal, leaving as much of the fine coal as he could behind him. This resulted in a loss for many years of from 5 to 10% of the entire amount mined being left in the mine. There has been a determined and successful effort on the part of the operators, however, during the past few years to compel the miner to load all the slack and fine coal in the mine. The result at the present time is that not more than 1% of the product is being left in the mine.

In summarizing the production and waste in the mining and shipping of Pittsburg coal, I will take as a basis, an average thickness of vein of 4 ft. 6 ins., which prevails within a radius of 30 miles of Pittsburg, and comprises at least 80% of the amount of the coal that is being shipped as raw coal, though of course the production is a great deal larger per acre in the so-called thick coal veins and in the Connellsville region, where the product is not shipped as raw coal. Assuming the specific gravity of our bituminous coal at 1.4 (a fair average), the actual weight of an acre of coal 4 ft. 6 ins. thick would be 7,657 tons. The best average production per acre that I have ever been able to obtain from a considerable area of coal is as follows: 4,650 tons of 1¼-in., or lump, coal, 1,425 tons of nut coal, 1,425 tons of slack coal; total, 7,500 tons per acre. I would place the average production per acre of the Pittsburg coal of 4 ft. 6 ins. thickness at 4,226 tons of 1¼-in., or lump, coal, 1,137 tons of nut coal, 1,137 tons of slack coal; total, 6,500 tons per acre, being an average loss of possibly 1,000 tons per acre, which is worth, under the tipple, an average price as "run of mine" coal of 80 cts. per ton, or $800 an acre, or more than four times the first cost of the average acre of coal. While this proportion of loss is quite large compared with our own ideal standard, based on what is possible in the most perfect bed of coal in the world, yet when compared with the amount of coal recovered from the anthracite and other than the bituminous beds I have spoken of, our results are surprisingly good. A very few years ago a member of the State Geological Survey estimated that not over 27% of the anthracite coal in a given area mined was actually shipped to the market, the balance being lost in pillars and breaker waste.

A WHITE HYDRAULIC CEMENT.

A deposit of white hydraulic limestone capable of making a hydraulic cement perfectly white in color has been found in northern Florida, near the Apalachicola River. The discovery was made by Mr. H. S. Du Val, C. E., of River Junction, Fla., in November, 1890, and he, with his associates, purchased the land and began experiments to determine the value and adaptability of the material for structural purposes. The natural rock is a magnesian limestone, looking much like white chalk, and when dug up and exposed to the weather it crumbles into pieces, and if exposed to the rain dissolves and flows away. Burned to vitrification the material melts into liquid glass. During calcination the color changes as the material approaches vitrification, so that in order to preserve the white color it is necessary to stop calcination at a certain point. The strength of the cement increases as the calcination of the raw material approaches vitrification. An analysis of the cement made by Stillwell & Gladding, of New York city, in 1892 gave the following results:

Moisture at 100° F.	2.4
Silica	16.72
Iron-oxide	0.90
Alumina	3.75
Lime	24.20
Magnesia	13.32
Soda	0.59
Carbonic acid	33.60
Sulphuric anhydride	0.58
Organic and volatile	3.26
	100.00

The tensile strength of the neat cement is stated by Mr. Du Val to vary from 100 to 600 lbs. in seven days. Samples of the natural rock and of a briquette, stated to have broken at 240 lbs. at an age of 24 days, which have been sent to us, show both the natural rock and the ground cement to be about the color and appearance of plaster of paris. Both the rock and the piece of briquette can be easily shaved away with a knife.

The chief value of the cement, of course, provided that its strength and durability prove equal to ordinary American natural cements, lies in its pure white color, which adapts it for use in connection with marble, onyx and alabaster work in building construction. It is stated that the deposit is so located as to be easily and cheaply quarried, and that wood, with which the region abounds, proves to be a satisfactory fuel for calcination.

DIAGRAM FOR DISCHARGE OF 2 TO 7-FT. BRICK CONDUITS FLOWING FULL.

By F. S. Bailey.

The diagram here shown is supplementary to one which appeared in Engineering News for Aug. 11, 1892, and which was designed by Arthur N. Talbot,

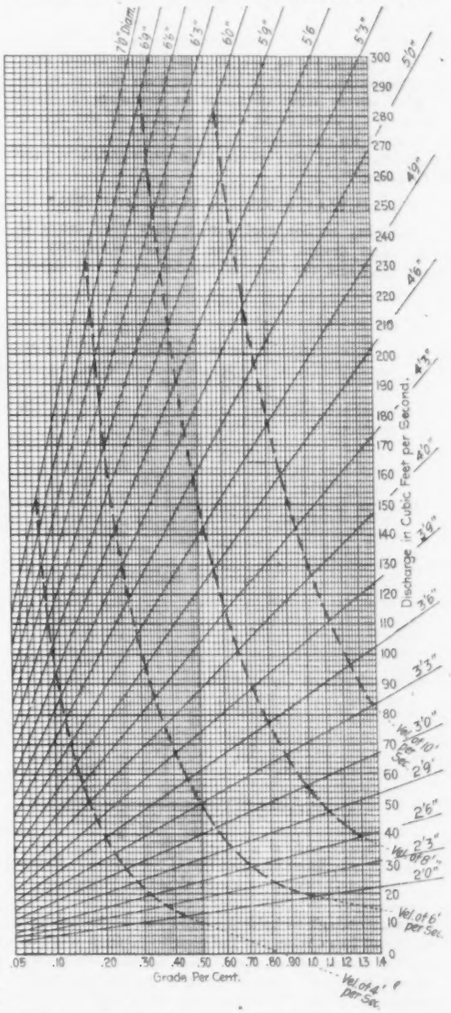


Diagram for Discharge of 2 to 7 ft. Conduits Flowing Full, Based on Kutter's Formula, with n = 0.015; Plotted by F. S. Bailey.

Professor of Municipal Engineering in the University of Illinois.*

Professor Talbot's diagram was accompanied by a very full description, so it is only necessary to refer to his article for a detailed explanation of the method of construction.

Briefly, the diagram is based on Kutter's formula for the velocity of water in pipes and conduits, the formula being modified so as to permit of its results being shown graphically.

The greatest variation in the results between the original formula and the modified form, within the limits of the present diagram, occurs in the case of a 2-ft. diameter on a 0.04% grade, where the variation is a trifle less than 2%; for the same diameter on the 1.4% grade the variation is less

*See Eng. News, April 27, 1893, for list of hydraulic diagrams published in this journal up to that date; in Eng. News for Jan. 4, 1894, a diagram was given for flow of water in 6 to 84-in. pipe with n = 0.013.—Ed.

than 1%, and as the difference gradually becomes smaller, till in the case of the 7-ft. diameter it amounts to only about 0.5% on the 0.04% grade, it is clear that the results are practically identical.

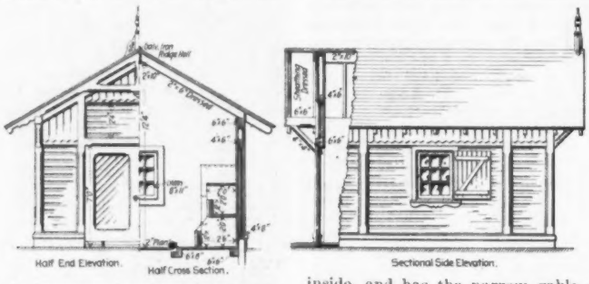
Professor Talbot's diagram showed the discharges from pipes ranging from 6 to 24 ins. in diameter. Sewers and drains between these diameters, or at least between 6 and 20 ins., are usually built of vitrified pipe and (n), the coefficient of roughness in Kutter's formula, was taken by him as 0.013.

In the present diagram (n) was taken as 0.015 to allow for the greater roughness of brick, of which all the sizes of sewers shown, from 2 to 7 ft. in diameter, would probably be built. This coefficient for brick is recommended by Trautwine and used by P. J. Flynn in his hydraulic tables and is generally adopted by other engineers.

Although only circular sewers are shown, the diagram would be of use if some other shape were to be employed, for if the necessary size of a circular sewer were obtained to discharge a given amount, a close guess could be made of the dimensions of an egg-shaped or some other form of equal capacity, and they could then be verified by the formula.

RAILWAY SECTION TOOL HOUSES.*

Railway section tool houses vary very much in size and design, according to the importance of the road and the ideas of the designers, but should



Standard Section Tool House; Pennsylvania Lines West of Pittsburg.

be large enough to hold the hand car, tools and supplies and leave room for the men to do such work as cutting shims, sharpening tools, sorting scrap, etc., in wet weather. The building is usually oblong in plan, and, if very small, should be placed with its longer side towards the track, with the handcar track laid through one end of that side, so as to leave the other end of the building unobstructed for the men to work in, but with buildings 14 or 15 ft. wide the track may be laid in the middle. There should always be room for the car to stand between the building and the track. Shelves, hooks and racks for tools should be provided to suit the equipment, and there should also be boxes, half barrels or shelves for different kinds of scrap. Long-handled tools, bars, etc., may be stood on end, with the tops resting in inclined notches in a shelf. There should be a locker or cupboard for special or expensive supplies and tools, and this may be placed in a room partitioned off for the use of the foreman, if he is required to do much writing up of reports, etc. Sliding doors carried on overhead rails and rolling aside like freight car doors are very generally preferred to swing doors, as being more easily handled in stormy weather and less likely to get out of order by being slammed or blown to and fro.

One of the simplest and cheapest forms is a house 9 × 12 ft., 7 ft. high, or 10 ft. to the top of the pitched roof, and having double swing doors in the narrow gable end facing the track. The sills are 6 × 6 ins.; plates and rafters, 2 × 4 ins.; floor beams, 4 × 8 ins. and 13 ft. 4 ins. long, spaced 27 ins. c. to c., and having a floor of 2-in. planks, with handcar rails 2 × 3 ins. nailed to the floor. The sides are of vertical boards and battens, and the roof is shingled. As a general thing, however, a larger and more convenient building than this is preferred, and the accompanying cut represents the standard section tool house of the Pennsylvania R. R. lines west of Pittsburg, which is a neat and convenient design for a good-sized house. It is 15 ft. 2 ins. long and 13 ft. 3 ins. wide in the clear inside, with double swing doors, and having the handcar track in the middle. Some roads prefer doors hung from a top rail and rolling instead of swinging, as already noted, but we are informed that there is no trouble with these swing doors. The construc- no trouble with these swing doors. The construction of the building and its interior arrangement are too clearly shown to need much description. The building is painted in two shades of light greyish brown, and the cost averages $175. We are indebted to Mr. Thomas Rodd, M. Am. Soc. C. E., Chief Engineer, for the blueprints from which our cut is made.

The Lehigh Valley R. R. tool house is 16 × 20 ft. inside, and has the narrow gable end towards the track, with a wide sliding door at one side for the handcar and a smaller door for the men at the other end of the same side. As the sliding door fouls the small door when open, it would probably be better if the smaller door were placed in the end of the building, although, of course, a man is not likely to try to open this door when the large door is open. This tool house has a foreman's room 6 × 8 ft. in one corner, and at the rear end are a workbench and fireplace.

LOCOMOTIVE DRIVING BOXES.

An important subject discussed at the September meeting of the Central Railway Club was the best construction of locomotive driving boxes, with especial reference to the comparative merits of solid bronze boxes, compared with cast iron or cast steel with bronze lining, and with cast iron or cast steel with ribs of bronze having soft metal strips. Mr. West (N. Y., O. & W. Ry.), from the committee on that subject, presented the following report:

Your committee are unanimous in their conviction that the solid bronze box is not to be commended for general use. They do not agree as to the relative merits of cast steel as compared to cast iron boxes, nor as to solid bronze lining, compared with the gib brass in connection with soft metal filling. Our reasons for not recommending the general use of solid bronze boxes are as follows: 1, Greater cost; 2, Undue expansion when hot, causing box to stick in jaws of frame; 3, When box becomes worn in crown the sides are apt to close up, pinching journal and resulting in a hot box.

As to the relative merits of cast steel and cast iron boxes, one member of the committee reports excellent results from the former, having gib brasses with the soft metal filling. His experience covers a period of 18 months, during which time no undue lateral motion developed, and there was entire freedom from hot boxes; the freedom from lateral motion might possibly have resulted from soft metal strips, the ends of which wore against wheel hub. The argument in favor of the solid bronze bearings is that they cost less than the gib brass with soft filling, while if the journal gets hot, there is no soft metal to melt and plug up oil holes. Boxes with gib brass are more liable to break on account of cracks starting from corners of slots cut for brass.

The argument in favor of a solid bronze crown pressed into the cast iron box, with two strips of soft metal 1 in. wide extending the full width of box, is that we believe the bearing will run cooler on account of the soft metal.

The argument in favor of the sectional bearing, composed of a bronze gib with soft metal filling, is that there will be no hot boxes to melt the soft metal filling. Out of 300 boxes changed in the past 18 months from solid to sectional, only two have had soft metal run out from heating, and in the same class of engines solid bearings which required renewals in every six or eight months are now run with sectional bearings twice that length of time.

The committee heartily indorses the practice now in vogue on many roads of planing the flanges straight at the center for a distance of 2½ ins., and tapering from there to the top and bottom, which allows the box to adjust itself when one wheel strikes low joint, thereby preventing the breaking of the flange. Two of the committee have had no experience with the steel boxes and prefer cast iron boxes to steel, as they are fearful of excessive side wear with the latter.

Discussion.

Mr. West.—We attribute the good results obtained with the steel box to the soft metal filling running up against the wheel hubs. We built four heavy mogul engines in the fall of 1892, with flanges on all drivers, and they have been in service ever since, and have shown the least lateral wear of any class of engines we have. We have also put those same boxes into four eight-wheel engines with the same results. Whereas formerly there was developed anywhere from ¼ to ⅝-in. ateral motion between shoppings, they now show on coming to the shop scarcely any more wear than when they were new. Hot boxes very seldom occur with a lead-lined bearing, and it is the same with hub linings. If you use soft metal you do not have a hot box to melt it out.

Mr. Foster (Fall Brook Coal Co.).—We have to use solid bronze boxes on account of the flanges being thin on our road. It has always given good service for us, and we have never had any trouble with it. I have also used the boxes with three gibs and soft filling with success; but I believe in the solid brass liner; I believe in the strip of soft metal about an inch wide running clear through the box; I think they wear better and are not quite so apt to heat as the solid bronze.

Mr. Mackenzie.—I have had the usual experience with cast iron boxes, broken flanges and broken boxes. About two years ago we took up the steel driving box with a square brass. The trouble with the cast iron box with the circular brass, or the gib brass, has been that the brasses would get loose. The first idea we had was to get something that would stop that. We made a steel box and made the brass fit square and go down the whole length of the box. The cellar is fitted in between the brass and the oil cup, so that we have a perfect contact of brass and metal, easily fitted. The brass is made square, with a flange cast on the outer edge of it, which is the hub protector. Or, in other words, we run the brass against the hub instead of the steel. We have an engine in the shop now that has made nearly 115,000 miles in 15 months. The boxes were worn a little loose on the journal, but all that was necessary in that case was to recrown the brass and let it down. The brasses were absolutely as tight as they were the day they were put in, but we found a terrific wear on the wedges. The cast iron wedge and the steel box will not wear together. That is the only trouble we find with those boxes. Now we are planing those boxes out and putting a bronze gib on the face of the box where it wears, and using wrought iron wedges. We propose to case-harden those wedges, and we think we will have a driving box that will not give out for a good many years.

Mr. Pomeroy.—The M., St. P. & S. S. M. Ry. have been putting a babbitt lining on the hub of the wheel. They drill three or four holes on the top and rag the holes, and build around the hub and pour in the soft metal on it and face it off, and they have taken up the lateral motion of the hubs in their steel driving boxes so that they have very little trouble at all; and I understand that Mr. Foster is using a loose ring for the same purpose.

Mr. Foster.—I have been putting a loose ring on the hub, of cast iron, ½ in. thick. It is loose so that it can revolve. If it gets a little dry on one side, next the box, it will slip on the driver; and being set into the driver, no dirt can get in behind it. I have an engine so fitted, which has been running for three or four years and has not required the side motion taken out of it in that time. I also run the trucks in that way. They run for years without any trouble.

Mr. Smith.—I hardly believe in the babbitt when that can be dispensed with. It causes excessive wear to every part it touches. If any one wishes to determine that, let him take a driving-box brass and make recesses for the babbitt shorter than the width of the brass, leaving a small brass section at each end to hold the babbitt in. When the wheel is dropped it will be found that where the babbitt is it will be worn anywhere from 1-32 to 1-16 in. smaller than at the ends. We had an engine constructed in that way, and invariably when the brasses were taken out we found the journals worn where the babbitt was, while at each end there would be left a shoulder. We then put brass clear across and a strip of babbitt clear across, and that overcame the difficulty.

Mr. Mackenzie.—Our experience with babbitt has been excessive wear of journals. I do not know whether Mr. West has paid particular attention to that or not, but we did in the construction of engines originally on the N.Y.,P.& O. road. They were made with gib brasses filled with babbitt. Probably 60% of the journal-bearing was babbitt. The consequence was that there was

* From a forthcoming work on "Railway Track and Signals." Copyrighted, 1894, by Engineering News Publishing Co.

a wear of journals of from ⅝ in. to ⅞ in. in about 400,000 miles. Now, with the solid brasses, we find that the less babbitt you get in there the less the journal wear, and we have got our journals down now until there is only ½ in. of babbitt metal presenting itself to the journal, and that is the best that is made, and costs about as much as bronze. We simply use that as a lubricant to assist the journal if there should

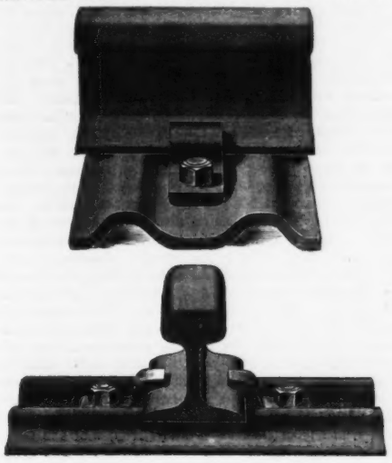


Fig. 1. Daniels Steel Tie.

be any tendency to heat, and we think, with the experience we have had in the last two or three years in the use of solid bearings, with this small strip of babbitt, that we have accomplished the object we started out for.

President Waitt.—It might be interesting to figure out the comparative weight of a horizontal section of the bearing on our heavy passenger and freight engines, or passenger engines especially, going at a fast speed, as compared with the same on sleeping car journals, which are heavy, and see, if the weight per square inch does not vary very much, whether it would not be cheaper and equally satisfactory to make the driving boxes of locomotives in a manner very similar to that used for cars. If the weights do not vary very much, it seems as though a great deal of careful fitting, to fit exactly to the diameter of the journal in the first place, might possibly be avoided by boring the driving box to the proper diameter, but leaving the fitting to adjust itself through a very thin lining of lead or babbitt metal. That is merely a suggestion that occurs to me in connection with these different opinions that have been expressed to-day, and in view of the experience that Mr. Bissell and some of the other gentlemen have expressed with regard to heavy sleeping-car journals.

Mr. Miller.—The roadbed has a great deal to do with the service of journals. I will guarantee that with soft metal on the Lake Shore, where the sand is rolling up from one end of the track to the other, journals would give out very quickly. On a rock ballast, or where there is freedom from that condition, I have no doubt that there would be a marked difference in the wear.

THE DANIELS STEEL TIE.

While steel ties are not likely to find any extensive application on steam railways in this country for some years to come, there appear to be reasons for their rapid adoption on street railways running

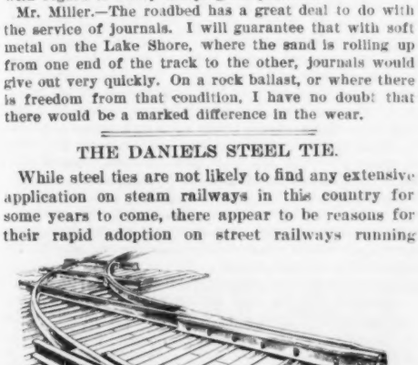


Fig. 2. Street Railway Track with Daniels Steel Ties.

through paved streets. Wooden ties in such cases are liable to very rapid rotting, and inspection or renewals of ties cannot be effected without tearing up the paving. Steel ties make a much more substantial and durable track, especially when laid upon or embedded in concrete, and we illustrate this week the Daniels tie, used in the Terre Haute electric railway, the construction of which is described in another column. The ties have also been laid for a block at New Castle, Pa., and 200 are to be laid at Cincinnati. They are manufactured by the Daniels Steel Railway Tie Co., of Youngstown, O., of which Mr. Thomp Burton is President.

The ties are corrugated plates, with bolted clamp fastenings, as shown in Fig. 1, while Fig. 2 shows a section of track laid with them, but before the clamps were bolted up. For street railway work ties 7 ft. long, 7 ins. wide, and weighing about 56 lbs. are believed to meet all requirements and can be sold at 1 1-9 cts. per lb. at the works, or 70 cts. per tie, including the four bolts, nuts and clamps. They can be made of any desired length for use at turnouts and crossings.

A fog signal device has been patented in England which includes a gong on the signal post, so that enginemen can tell when they are approaching a signal. It might be practicable to arrange it so as to ring to indicate whether the signal is at track clear or track blocked.

Portable railways are used on a number of farms in France, and the French "Journal of Practical Agriculture" states that there is likely to be an important extension of the system. It is pointed out that by these lines crops can be moved much more rapidly than by ordinary cartage; that the power required is much less; that asses or mules can thus do work for which horses or oxen would be required,or a steam motor can be employed; and that these lines can be laid through lands over which it would be too expensive to build roads. Steel instead of iron rails are recommended. A complete plant for about 1,000 ft. of line, six cars, crossings, switches, etc., can, it is claimed, be built for $400 to $500. Portable railways are also extensively used in the construction of public works and on large contracting undertakings.

A combined trolley and gravity railway in Fairmount Park, Philadelphia, has been favorably considered by the Park Committee of Councils, and the Park Commission is recommended to grant a license for the same. The plan includes a line running around the boundary of the Park and crossing the Schuylkill on a bridge to be built for the purpose, near Laurel Hill Cemetery. The project is an old one and all now depends upon the action of the Park Commission. The street railway magnates of Philadelphia favor such a line, and the plea is advanced that in no other way can some of the most beautiful, but distant, parts of the Park be made accessible to the general public. On the other hand, strong objections are made to a trolley and also to the erection of any structure which may interfere with the natural landscape.

The new hotel which is to be built in New York by John Jacob Astor will be the "largest and finest in existence," says the manager of Mr. Astor's property. It will adjoin the "Waldorf," built by Wm. Waldorf Astor, on Fifth Ave., and will have a front of 100 ft. and a depth of 350 ft. on 34th St. It is to be 20 stories high and the estimated cost is about $8,000,000. The new hotel will be operated by Mr. Boldt, who now leases the "Waldorf," and the opening day has been fixed for Nov. 1, 1897.

The elevation of all railway tracks in Indianapolis is recommended by the commissioners appointed to report upon its feasibility, and the estimated cost is placed at $2,000,000. Solid walls of masonry are favored, with earth filling between. Another proposition considered is to compel all railways to use one elevated east-and-west line through the city, diverging north or south after leaving the city. The commission believes that the cost of elevating the tracks should be equally divided between the city and the companies. The city has the right to compel track elevation under existing law, and proposes to eliminate dangerous and numerous grade crossings.

The deepening of the Sault Ste. Marie Canal, on the Canadian side, is to be proceeded with, under a new loan of $2,500,000 just secured in England by Mr. Geo. E. Foster, the Canadian Minister of Finance.

Bids for preparing plans and specifications for a water-works system were received by Brightwood, Ind., a suburb of Indianapolis, on Oct. 26. There were 19 bids received and the prices ranged from $150 to $550. A press report says:

The committee decided not to accept the lower ones, fearing the quality of the service to be rendered, and finally narrowed the contract down to two of the bidders, whose figures were between $300 and $400. The committee will make the contract with the one who will agree to make a fixed charge for the sum total for his services, no matter what they may be, in preparing satisfactory plans. The committee wishes to avoid a bill for "extras."

The East River Co., incorporated in 1892 for the purpose of building two bridges across the East River, is showing some little signs of renewed life by appointing a committee to decide upon the future action of the company. These bridges were designed to connect with the Brooklyn elevated railways, and cross the river at a height of 135 ft., landing in New York near Rivington St. It was proposed to cross over the Second and Third Ave. elevated railways, and pass across the city, through Spring St., to a connection with the Sixth and Ninth Ave. elevated lines, and on to Desbrosses St. Ferry. The consent of the New York City Council was obtained, for this cross line, on March 22, 1893; provided that the rate of fare should not exceed 5 cts., and that property owners should acquiesce. The majority of the property holders have refused their consent, and a commission was appointed; but its report, favoring the construction of the bridge and cross-line, was not confirmed by the Court, and the Spring St. line was not approved of. An appeal was taken to the Court of Appeals; but the decision was that this Court had no jurisdiction. The committee now appointed is to consider what is best to be done under this condition of affairs; but Mr. Uhlman, the chairman, says that it is not likely that any definite results will be arrived at for some time to come.

A company is being organized in Baltimore, Md., says the "American" of that city, to build a dam across the Susquehanna River, at Conowingo, and by the water-power developed create and transmit electric power to Baltimore and other places. Conowingo is 35 miles from Baltimore, and it is claimed that a fall of about 45 ft. can be secured. As yet the scheme is simply on paper, and the estimates point to an expenditure of several millions before any power can be secured.

Hoffman Island, the quarantine station in New York harbor, is to be enlarged to the extent of six acres by pumping dredges. Wooden cribs filled with stone will define the new boundaries of the island, and inside this enclosure sand will be discharged by means of rotary pump dredges delivering their sand and water through pipes supported on pontoons. The New York legislature has appropriated $160,000 for this enlargement, and the work has begun.

Gas from coke ovens is to be utilized as fuel under boilers at the Bessemer, Ala., pipe foundry of the Howard-Harrison Iron Co., according to report. It is the company's intention to erect 100 coke ovens to manufacture its own fuel for use in the cupolas, and the gas from these ovens is to be used as boiler fuel and to bake the cores in the drying ovens. The surplus coke will be sold.

A large structural steel plant is to be erected near Buffalo, N. Y., according to press reports, by the American Structural Steel Co., of Pittsburg, Pa., a corporation which was organized Feb. 3, 1894, by Messrs. H. Sellers McKee, Mark M. Watson, E. M. Butz and others, of Pittsburg. The company is to manufacture a new steel column, designed and patented by Mr. Butz, of H section. These columns are to be rolled in one piece directly from the ingot by special machinery. The company is said to have contracted for a site for its works between the cities of Buffalo and Tonawanda, agreeing to begin work on the construction of its plant by Jan. 1.

Aluminum is not well adapted to naval use, where corrosion may take place, according to recent experiments of the Navy Department. Two 1-16-in. plates, one pure aluminum and one alloyed with nickel, were immersed in salt water for three months at the Norfolk navy yard; when removed, both plates were in bad condition. Both had a heavy crop of barnacles on them, and the heaviest growth was on the pure aluminum. The pure metal was badly pitted, and the alloyed plate nearly as much so. For use in the hulls of torpedo launches, however, it is thought that as these boats are seldom in the water for a long time, being usually carried on board the battleship, the greater lightness and consequent increased facility in handling them will ultimately bring about the use of aluminum in their construction.

A new type of disappearing gun carriage has been invented by Col. S. M. Mansfield, Corps of Engineers, U. S. A. The design is novel and simple and appears to possess great merits, and it would be much less costly than other carriages of a similar type. It embraces an upper and lower carriage, with intermediate guide rails and a counterpoise. There are no recoil cylinders. The gun, when in the loading position, is held by a clutch, and on the release of this clutch the counterpoise descends into a wall, just under the forward pivot, and hauls the upper carriage into the firing position, by rollers running on the guide rails. The gun is sent down the rails by the recoil with sliding friction, by an ingenious arrangement; and, striking buffers at the end of its path, it is automatically locked again in the loading position. The gun is trained and elevated while in the loading position below the parapet, and is easily worked by a small crew. The parts are simple and strong, and

delicate machinery has been avoided in the construction. For a 10-in. gun the estimated cost of such a carriage is less than $25,000, as compared with $35,000 to $50,000 for carriages of the types at present in use.

The Denver Union Water Co. has been incorporated and effects a consolidation of the two rival companies at Denver, Colo., which carried on a bitter war of rates for a number of months. The capital stock of the new company is $7,500,000 and it succeeds eight separate companies which have in the past played a part in the water supply of Denver and surrounding towns, but all these companies, except the Citizens' Water Co., were under the control of the American Water-Works Co.

The International Geodetic Association held its annual congress lately at Innsbruck, in the Tyrol. The congress was especially interested in discussing the study of small displacements of the earth's axis, a movement suspected for some years, but now fixed beyond doubt. Mr. Van de Sande-Bakhuysen, delegate from the Netherlands, showed that these displacements presented a curious relation to the variations in the mean sea level on the coasts of Holland. The congress recommended the founding of national observatories fitted with instruments especially adapted for observing these movements. The next congress will be held in Berlin, in 1895.

PERSONALS.

Mr. C. S. Shannon, General Manager of the New Orleans & Northern Ry., has tendered his resignation.

Mr. C. A. Moreno has been appointed Roadmaster of the Vicksburg Division of the Yazoo & Mississippi Valley R. R., vice Mr. J. C. Hutchins, resigned.

Mr. H. E. Burt has been appointed General Superintendent of the Minnesota & Wisconsin Ry., vice Mr. James Monogue, with headquarters at Spring Valley, Wis.

Mr. G. R. Mathews has been appointed General Superintendent of the Buffalo, Rochester & Pittsburg R. R., of which he has been Acting General Superintendent for several months.

Mr. George E. Dawson has been appointed Attorney for the Sanitary District of Chicago, vice Mr. Orrin N. Carter, resigned. Mr. Charles C. Pickett has been appointed assistant to Mr. Dawson.

Prof. S. F. Emmons, of the United States Geological Survey, will have general charge of the geological work to be carried on in the Rocky Mountain region. He is at present in Leadville, Colo., on special duty.

Mr. George L. Bradbury, General Manager of the Lake Erie & Western R. R., has been elected Vice-President of the Cincinnati, Jackson & Mackinaw R. R., and will have charge of the operation of the road.

Mr. W. N. Bannard, Superintendent of the Altoona Division of the Pennsylvania R. R., has been appointed Division Superintendent of the Buffalo Division of the New York Central R. R., with headquarters at Buffalo, N. Y.

Mr. M. L. Byers, Engineer of Maintenance of Way of the Indianapolis Division of the Pittsburg, Cincinnati, Chicago & St. Louis Ry., has been transferred to the Chicago Division, and Mr. W. C. Loree will return to the Indianapolis Division.

Mr. John Pownall, Assoc. M. Inst. C. E., Principal Assistant Engineer of Potter & Folwell, civil and sanitary engineers, New York, sailed on the "Etruria," Nov. 11, for England, to examine and report upon European practice in refuse destruction.

Mr. Charles H. Schlacks, Superintendent of Machinery of the Denver & Rio Grande R. R., has been appointed Assistant General Manager. He was Superintendent of Machinery on the Illinois Central R. R. for ten, years, resigning early in 1893.

Mr. W. S. Morris, Superintendent of Motive Power of the Chesapeake & Ohio Ry., has been elected President of the Central Railroad Association of Cincinnati, an association of the officers of the operating departments of the railways entering that city.

Mr. H. B. Potter, who was at one time Engineer of Maintenance of Way for the Troy & Greenfield R. R. and Hoosac Tunnel, and more recently with the Ramapo Iron Works, has accepted a position with the Wharton Railroad Switch Co., of Philadelphia, Pa., as general representative.

Mr. Charles A. McAlpine, Superintendent of the Northern Division of the Old Colony system of the New York, New Haven & Hartford R. R., has been appointed Superintendent of the Providence Division, with headquarters at Boston, vice Mr. I. N. Marshall, who is transferred to the Northern Division on account of ill health.

Mr. Andrew De Graff, a well-known railway contractor, died at St. Paul, Minn., Nov. 7, at the age of 83. He was born at Amsterdam, N. Y., in 1811. His first work on railway construction was done on the Utica & Schenectady Ry., now a part of the New York Central, and he was next engaged on the Norwich & Worcester, Auburn & Rochester, Attica & Buffalo and Buffalo & Batavia railways. He then removed to Sandusky, O., and later to Dayton, O., and in the years from 1843 to 1857 was engaged in the construction of many different Ohio railways. He then transferred his field of work to the Northwest, and built many lines, in Wisconsin, Minnesota and Dakota.

NEW PUBLICATIONS.

WAYS AND WORKS IN INDIA. Being an account of Public Works in that country from the earliest times up to the present day. By G. W. Macgeorge, M. I. C. E., late Officiating Consulting Engineer to the Government of India for Railways. London: Archibald Constable & Co., publishers to the India Office. 8vo; cloth; pp. 565; many illustrations and maps; 16 shillings ($4.00).

This is an interesting work upon subjects little known in the United States. Under the head of public works, ancient and modern, the author includes a general description of the Indian trigonometrical survey, roads, irrigation works, railways, water supply for towns, the electric telegraph and sea and harbor works. India, on March 31, 1892, had in operation 17,564 miles of railway, of which the government owned about 14,000 miles and had contributed 153 out of the 227 millions sterling expended in the construction of these roads. The result to the state on the operation of Indian railways was a net profit of about $950,000 in 1891-92, excluding the interest on 1,097 miles of railway then under construction. This $950,000, it should be clearly understood, is the actual net profit to the government. When it is said that the government has furnished £153,000,000 of the capital invested in Indian railways, what is really meant is that the interest on bonds to this amount has been guaranteed by the government, and the profit above noted is what remains after all expenses of operation and maintenance, and the interest on all the capital invested in the lines has been paid. It is highly interesting to note that the operating expenses of Indian railways average only 47% of the gross earnings, against some 70½% in this country. The lower rate is due to the enormous difference in the wages of labor. The first railway in India was opened to traffic on April 16, 1853, and included the 20 miles of track connecting Bombay and Tarmah. The author goes into the detail of the foundation and construction of the various systems now connecting Bombay and Calcutta, on the east and west line, and extending north and south from the extreme southern point of India to the gateway to Afghanistan, on the north. Engravings of prominent railway bridges and of the Khojak tunnel and its approaches show some of the structural difficulties overcome by the Indian engineers, by methods explained in the text.

The highways of India received little attention from the English government until within comparatively recent years. The first improvement of this kind was the somewhat celebrated "Grand Trunk Road," extending from Calcutta to Peshawur, a distance of 1,500 miles. Warren Hastings, in 1772, is said to have made a beginning on this military highway; but the most of it was built in 1830-35, and in 1855 the road was finished to a point 75 miles north of Delhi, or 1,000 miles from Calcutta. This road is now an embanked, thoroughly drained, well metalled highway, 40 ft. wide, permanently bridged throughout. Its cost is unknown, as much of it was built by convict, or famine-relief labor. Other road systems are fully described, together with the bridges and other public works upon them.

Irrigation works naturally take up much space, as it is estimated that these works have increased the production of rice, the chief food supply of India, as much as 40%. In the Madras Presidency, irrigation increases the product from four to ten-fold, according to the crop, and irrigated land brings from twelve to fifteen times the rental of unirrigated land. Irrigation itself antedates written history in India, and in the rainless regions of the Indus basin many of these early canals are still to be met with, ranging from 10 to 300 ft. in width and from 3 to 10 ft. in depth, and in all lengths up to 70 miles. The Kaveri Delta dam, 1,080 ft. long and 40 ft. wide and made of rough stone, was constructed over 1,600 years ago, and was the foundation of the great Delta system of irrigation since carried out by the British. In southern India "tank storage" of water was the favorite method adopted by the natives; and in Madras there are said to be 43,000 of these native tanks, some of fabulous antiquity, with 30,000 miles of embankment. Some of these tanks are of enormous size, like the Ponalry tank in Trichinopoli, which has an earthern embankment 30 miles long, enclosing an area of between 60 and 80 sq. miles. The Cummun tank, in the district of Guntoor, is formed by closing a gorge, 300 ft. wide, by an earthern embankment over 100 ft. high; the slopes being 2 to 1, with the inner slope carefully covered with large stones. On the River Lokani is another earthern bank, 117 ft. high, 200 ft. wide, with a base of 400 ft. on the axis of the gorge. The Nuggar tank, in Mysore, has an embankment 1,000 ft. long and about 85 ft. high and is 600 ft. wide at the base. Many of these tanks, or storage reservoirs, are in a chain, or series, so arranged that the overflow from the highest reservoir fills the next, and so on to the lowest. The first irrigation work performed under English rule was the restoration, in 1817, of Shah Jehan's Delhi branch-canal, originally built in 1626. Since that time canal work has been going on continually, especially in the Punjab, where, up to 1890-91, the English government had expended £6,435,818 in canals, in addition to £1,402,450 contributed by native states. At that date there were 4,058 miles of main and branch canals, with 7,545 miles of distributing channels. Of this system 432 miles are available for navigation. The perennial canals irrigated an area of 2,601 sq. miles, and the inundating canals irrigated 1,840 sq. miles, or 4,441 sq. miles in all. The estimated value of crops raised in this district in 1890-91 was £8,815,777; and on the seven large "productive" works built by the government the percentage of revenue to capital outlay was 5.91%.

The Ganges Canal, one of the largest works of the kind in existence, was commenced in 1836 and completed in 1854. With its many branches, it extends down the valley of the Ganges from the foot of the Himalayan Mountains to Cawnpore and Hamirpore, a total air-line distance of about 350 miles, and covering a width of 70 miles on the west side of the Ganges. Up to 1890 the English government had constructed, in the Northwest Provinces, 1,465 miles of main canal and branches, of which 535 miles are navigable, and 6,646 miles of distributing channels, irrigating 3,125 sq. miles of land. The capital cost of this work was £8,059,300 to the date given, and the profit was 4.58% upon this capital cost. In the Madras Presidency, up to 1891, there were 3,089 miles of main and branch canals, and 6,627 miles of distributing channels, with 1,275 miles of navigable canals. The area irrigated is 5,514,184 acres, or 8,615 sq. miles, and the capital outlay by the British government was over 6¾ millions sterling, yielding a net revenue of £751,000. The Bombay Presidency has only 606 miles of main and branch canals, with 564 miles of distributing channels, irrigating about 34½ sq. miles of territory. The government outlay on this work was, to 1891, £2,465,024, and the net revenue was 2.2% on this cost. In the whole of India about 16,000 miles of main and branch canals have been built by the English government, of which 2,882 miles are navigable. There are over 23,500 miles of distributing channels, which irrigate nearly 13,000,000 acres, or about 20,000 sq. miles of territory. The annual value of irrigated crops, excluding Scinde, is nearly 30 millions sterling, and the capital cost of the work on all classes of Indian canals is but little above this sum. The net revenue annually earned is nearly 1¾ millions sterling, or about 5½% on the capital cost, leaving an annual surplus above interest charges of over £725,000.

The first public water supply in India was that built for Bombay in 1857-58, and consisted of the construction of the Vehar storage reservoir, covering 1,394 acres, and located 180 ft. above the general level of the city. With an annual rainfall of 124 ins. it was not difficult to fill this reservoir. Other chief water supplies are described in this work at considerable length in order of date of constructing. The inland telegraph lines opened in India, in 1892, aggregated 36,625 miles in length, and cost £5,218,625. There were then 3,246 telegraph offices of all kinds. Sea and harbor works in India, form the final chapter to this work, but lack of space prevents any extended mention, though the detail is interesting. The book is somewhat unnecessarily padded out by chapters on the general history and construction of railways, etc., which are not exactly pertinent to the subject stated in the title. An appendix contains much tabular information relating to Indian railways and canals.

STATE BOARD OF HEALTH OF MASSACHUSETTS.—Report for the year ending Sept. 30, 1893. Samuel W. Abbott, M. D., Secretary; F. P. Stearns, M. Am. Soc. C. E., Engineer. 8vo.; pp. lix., 812; illustrations and many tables. Boston: Published by the Board.

This is the 25th annual report of the Board, and sets forth in detail the sixth year's work of the Lawrence Experiment Station, which has now a world-wide fame for its important investigations in water and sewage purification. Aside from the account of the work just mentioned, written by Mr. Geo. W. Fuller, Biologist in charge of the station, the report contains the usual advice to cities and towns on the subject of water supply and sewerage, nearly 300 pages of results of chemical and biological examinations of river waters, statistics and other matter relating to the public health, and the following papers: "On the Amount and Character of Organic Matter in Soils, and its Bearing on the Storage of Water in Reservoirs," by Thos. M. Drown, Chemist of the Board; "The Filter of the Water Supply of the City of Lawrence and its Results," by Hiram F. Mills, C. E., Member of the Board; "Sewage Purification of Cities and Towns in Massachusetts;" "Chemical Precipitation of Sewage at the World's Columbian Ex-

position, Chicago, 1893," by Allen Hazen, Chemist Department of Water Supply, Sewage and Fire Protection. The water and sewage purification plants at Lawrence and the World's Columbian Exposition, respectively, were each described and fully illustrated in our issue of Aug. 3, 1893. Mr. Mills' paper on the Lawrence filters is practically identical with one presented by him before the New England Water-Works Association last June, and briefly abstracted in our issue of June 21. Pro. Drown's paper is given nearly in full elsewhere in this issue, and further reference to some of the contents of this valuable report will be made in later issues.

VIRTUAL LENGTHS RELATIVE TO SPEEDS ON RAILWAYS.—By L. de Busschere, Engineer-in-Chief, Belgian State Railways. Published by the Author, Brussels. 8vo; paper; pp. 82.

In this book the author discusses the question of the virtual lengths of a train's run, as affected by its speed. Thus, if a railway management decides to shorten the time between certain stations, the actual speeds run will be much greater than the average speed, owing to conditions of grade and traffic, for on ascending grades the speed will not be much accelerated beyond that of the trains running on the slower schedule, the shortening of time being effected by higher speeds on the level and on down grades. To ascertain exactly what can be gained in time over the old schedule, it is necessary to calculate at what effective speeds the engines can haul the required train loads on the various grades of the line, and then to see if the train can run in accordance with these results under the shortened schedule. The question is gone into very fully and particulars are given of the methods of solution adopted by Von Borries, Leitzman and Halfmann, together with instances of its practical application. Thus, on the line between Brussels and Namur the virtual length in one direction is 28,559 meters, and in the other direction 20,847 meters. The length of the trip is 17⅔ minutes in the first case, and 12 8-9 minutes in the other, or 19 and 17 minutes respectively, including the time consumed in starting and stopping. The influences of grades and curves on speed, and the influence of speed on the working of the engines, as well as the train resistances, are discussed.

CENTRAL STATION BOOKKEEPING AND SUGGESTED FORMS. With an appendix for Street Railways. By Horatio A. Foster, M. Am. Inst. E. E.. New York: The W. J. Johnson Co., Ltd. 8vo; cloth; pp. 139; 75 forms and diagrams. $2.50.

In this work the author endeavors to present a classification of accounts and a system of reports for central electric light and power stations, with a view to keeping the management posted as to the full detail of the business of distributing electric current. While most of the large low-tension stations now keep quite accurate records of the details of distribution, little is done in this direction in high-tension stations, and in small stations usually no account is kept at all. It is not necessary to point out the business importance of being able to study the detail of operation and management, especially when there is any close competition. With the object of aiding in a systematic organization of stations, records and accounts, this book is written. It relates to the staff organization, classification of reports and accounts, with sample forms for each department, and the general conduct of business. The forms are based upon a close study of several hundred in practical use, and it is believed that they embody the best features of these forms. The appendix applies, in a similar way, to the organization and management of electric street railways.

REPORT OF THE VERMONT HIGHWAY COMMISSION, 1894. Published by the Commission, Burlington, Vt. 8vo; pp. 111; illustrated.

This is the report of the commission appointed in 1892 to make an examination of and report upon the highway system of the state, and is stated to be only a preliminary statement of the situation or a first step towards improvement, as the lack of funds has prevented the commission from undertaking investigations which it considers highly important to the solution of the highway problem. The plan described for the county organization of road commissioners has already been successfully carried out in several cases. The availability of local material for road construction is considered; wide tires are advocated, and highway legislation is discussed, while one chapter is devoted to practical notes on road construction. In the appendices Mr. W. S. Bacot, M. Am. Soc. C. E., describes the new system of street improvements carried out by him at Burlington. One appendix is devoted to road machinery. The illustrations include cuts of machinery and road details, and half-tones of improved and unimproved roads.

ACCURATE TABLES OF DIAMETER, AREAS, WEIGHTS, ETC., OF COLD-DRAWN SEAMLESS STEEL TUBING.—Calculated and published by O. J. Edwards, Ellwood City, Pa. 12mo; paper; 10 pp. of tables; 50 cts.

These tables give the external and internal diameters and areas of the several sizes, the areas of cross-section of metal, and the weight in pounds per inch and per foot of length.

TRADE PUBLICATIONS.

INTERLOCKING AND BLOCK SIGNAL APPARATUS.—The Johnson Railroad Signal Co., Rahway, N. J. 12mo; cloth; pp. 241; illustrated.

This is a handsome and comprehensive reference book of parts in connection with interlocking and block signaling, intended especially for the use of railway men who find it necessary to refer in detail to the signal work under their supervision. When the prices are filled in on the columns provided for that purpose it will serve also as a price list for the use of purchasing agents. All the various parts and small details are clearly illustrated and lettered, so as to facilitate the ordering of any parts. There are also half-tone illustrations of several specialties, including compensators, scotch blocks, rod carriers, dwarf signals and indicators, and the Webb & Thompson train-staff instruments (Eng. News, Jan. 18) for single-track working, now in use on a part of the Chicago, Milwaukee & St. Paul Ry. The Johnson interlocking machine is described and illustrated, together with complete sets of semaphore signal fittings. The company informs us that it expects shortly to issue a similar catalogue of parts of electrical apparatus used in interlocking and block signaling, and also a new general catalogue having reference more especially to the general principles of railway signaling, and showing by diagram and explanation what it considers the best practice in connection with the various branches of the art.

INTERLOCKING AND SIGNAL PLANT.—National Switch & Signal Co., Easton, Pa. 4to; leather; pp. 154; illustrated.

This is a very handsome and elaborate reference catalogue, giving detailed plans, illustrations and descriptive list of interlocking and signaling apparatus manufactured by this company, many of whose specialties have been illustrated and described in our columns. The illustrations are half-tones and working plans showing details of construction. In addition to descriptions of the several parts of the apparatus and connections, there are shown standard signals with wood and iron straight and bracket poles and from one to four arms, dwarf signals, three-position signals, the National torpedo signal, combined switch and signal stand with one lever, electric and mechanical slot devices, compensators, standard patterns of signal tower, automatic block signal, and other apparatus. The book is handsomely printed, and has a good general index. It is an excellent example of the modern tendency to complete and elaborate trade catalogues which are valuable additions to technical literature.

COAL MINING MACHINES AND AIR COMPRESSORS. Catalogue No. 50 of the Ingersoll-Sergeant Drill Co., New York city.

From the advance sheets of this catalogue, just received, it is evident that it will be a useful and interesting one to coal miners. Coal-cutters are illustrated working under various conditions and their operation is fully described. The cost of cutting is stated in detail and an estimate is included covering a complete plant for underground cutting and drilling. Considerable space is devoted to showing, by detailed figures of cost and output the saving effected by coal-cutting machinery. A net saving of 19 cts. per ton is claimed as compared with hand-labor. The catalogue is intended exclusively for the coal mining industry. It will be ready for distribution in a few weeks.

SOCIETY PROCEEDINGS.

CENTRAL RAILWAY CLUB.—The committee appointed to make a report on "Freight Car Door Fixtures" at the next meeting, in January, 1895, announces that it will be glad to receive from railway men, or others, any information or suggestions in reference to this subject, which may be addressed to Mr. John D. McIlwain, care the Union Car Co., Depew, N. Y.

NEW YORK RAILROAD CLUB.—The meeting of the current week will be held on Friday evening, Nov. 16, instead of Thursday evening. Mr. R. A. Parke will read a paper entitled "Economy in Compressed Air Transmission for Commercial Purposes and for Air Brake Purposes." This being the annual meeting, reports of officers will be presented, and the annual election of officers will take place.

ENGINEERS' CLUB OF ST. LOUIS.—At the meeting on Nov. 7 Mr. Edward Flad introduced the following resolution, which was adopted:

Resolved, That a committee of ten be appointed by the chair to report to the club a schedule of the customary charges made by engineers for services rendered either for consultation or expert work, reports, plans and specifications, etc., or for services by the month or year, with a view to establishing a record of the usual and limiting charges customary, rather than a proper schedule of charges.

Prof. H. A. Wheeler then read a paper on "The Merz Process of Handling Garbage at the South St. Louis Works." The works were fully described in Engineering News of Nov. 1. Wm. H. Bryan, Secy.

WESTERN SOCIETY OF ENGINEERS.—The regular monthly meeting of the society was held at the Grand Pacific Hotel Nov. 7. The greater part of the session was taken up with the transaction of routine business and the discussion of the proposed withdrawal of the society from the Association of Engineering Societies. A paper entitled "Refrigeration by Carbon Dioxide" was read by Mr. E. F. Osborne, and was followed by an oral description of the construction and operation of the apparatus designed by the author for producing carbon dioxide and transferring it for refrigerating and fire-protection purposes from a central station to the different consumers. The paper was illustrated by stereopticon views of the various apparatus.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—At the meeting on Nov. 5 the subject of "Transition Curves," introduced at the last meeting, was continued by the reading of several letters from engineers in various parts of the country, and an hour's general discussion followed, the substance of which will be prepared for publication. At the request of President Wilson, Prof. W. R. Hoag outlined the present relations between the Minnesota State University, the U. S. Coast and Geodetic Survey and the U. S. Geological Survey, touching the Geological and Topographical survey of the state. Pending an adjustment in December next of rather an unsettled state of affairs in this matter, of interest to engineers and citizens generally, a committee consisting of Messrs. Hilgard, Woodman and Stevens was appointed to investigate the facts in detail and report at the next meeting. C. L. Annan, Secy.

ENGINEERS' CLUB OF PHILADELPHIA.—At the meeting of Nov. 3, 98 members and visitors were present. Dr. Henry Leffman presented a paper upon "The Filtration of Public Water Supplies," and after describing the various systems of filtration, practically recommended simple sand filtration as entirely satisfactory, and especially adapted to the needs of large cities taking water from a populated watershed. Dr. Albert R. Leeds said that Philadelphia was a typhoid city, while London was a cholera city. Under the act of Parliament of 1850 the seven water companies of London are compelled to filter their water; and at the present time, while the water of the upper Thames is receiving more sewage than the Schuylkill, filtration takes care of it, and London now is having the lowest typhoid rate of any large city. Dr. Leeds claimed that bacteria could not be removed by ordinary filters, and he practically approved of chemicals or mechanical filters. Remarks were also made by Messrs. Trautwine, Cummings, Christie, Webb, Moore and Furber.

George T. Gwilliam, Secretary, pro tem.

COMING TECHNICAL MEETINGS.

SOCIETY NAVAL ARCHITECTS & MARINE ENGINEERS.
Nov. 15 and 16. Annual Convention in New York city. Secy., W. L. Capps, U. S. N., Washington, D. C.

NEW YORK RAILROAD CLUB.
Nov. 16. "Compressed Air for Commercial and Air-Brake Purposes," R. A. Parke. Secy., John A. Hill, Temple Court, N. Y. City.

FRANKLIN INSTITUTE, PHILADELPHIA.
Nov. 16. "Investigations in Bacteriology," Dr. M. V. Ball. Secy., W. H. Wahl.

ENGINEERS' CLUB OF PHILADELPHIA.
Nov. 17. Secy., L. F. Rondinella, 1122 Girard St.

ENGINEERS' CLUB OF MINNEAPOLIS.
Nov. 19. Secy., E. Nexsen, Kasota Block.

WESTERN RAILWAY CLUB.
Nov. 20. Secy., W. D. Greeman, Rookery Building.

COLUMBIAN ENGINEERING SOCIETY.
Nov. 20. Secy., F. W. Hart, Washington, D. C.

ASSOCIATION OF ENGINEERS OF VIRGINIA.
Nov. 21. Secy., J. H. Pilcher, Roanoke, Va.

BOSTON SOCIETY OF CIVIL ENGINEERS.
Nov. 21. Secy., S. E. Tinkham, 36 Bromfield St.

ENGINEERS' CLUB OF ST. LOUIS.
Nov. 21. Report on "Smoke Prevention." Secy., W. H. Bryan, Turner Block.

AMERICAN SOCIETY OF CIVIL ENGINEERS.
Nov. 21. "Storage Reservoirs on the Nile," Cope Whitehouse. Secy., Francis Collingwood, 127 E. 23d St., N. Y.

CANADIAN SOCIETY OF CIVIL ENGINEERS.
Nov. 22. Secy., C. H. McLeod, 112 Mansfield St., Montreal.

ENGINEERS' CLUB OF INDIANAPOLIS.
Nov. 24. Secy., C. C. Brown.

DENVER SOCIETY OF CIVIL ENGINEERS.
Nov. 27. Secy., F. Ed. King, 36 Jacobson Block.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
Dec. 3 to 7. Secy., F. R. Hutton, 12 W. 31st St., New York.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.
Dec. 3. Secy., C. L. Annan, City Engineer's Office.

WESTERN SOCIETY OF ENGINEERS.
Dec. 5. Secy., Thomas Appleton, Lakeside Bldg., Chicago.

TECHNICAL SOCIETY OF THE PACIFIC COAST.
Dec. 7. Secy., O. Von Geldern, 719 Market St., San Francisco.

MONTANA SOCIETY OF CIVIL ENGINEERS.
Dec. 8. Secy., G. O. Foss, Helena, Mont.

WISCONSIN POLYTECHNIC SOCIETY.
Dec. 10. Secy., Geo. G. Mason, 144 8th St., Milwaukee.

ENGINEERS' CLUB OF KANSAS CITY.
Dec. 10. Secy., F. W. Tuttle, Baird Building.

CIVIL ENGINEERS CLUB OF CLEVELAND.
Dec. 11. Secy., F. C. Osborn, 721 Hickox Building.

NORTHWESTERN SOCIETY OF ENGINEERS.
Dec. 11. Secy., D. W. McNorris, Burke Building, Seattle, Wash.

NORTHWESTERN RAILWAY CLUB.
Dec. 11. Secy., W. D. Crosman, Ryan Hotel, St. Paul.

NEW ENGLAND RAILROAD CLUB.
Dec. 12. Secy., F. M. Curtis, P. O. Box, 1576, Boston, Mass.

ENGINEERING ASSOCIATION OF THE SOUTH.
Dec. 13. Secy., Hunter McDonald, Nashville, Tenn.

ENGINEERS & ARCHITECTS' CLUB OF LOUISVILLE.
Dec. 13. Secy., G. W. Shaw, Norton Building.

NORTHWESTERN TRACK AND BRIDGE ASSOCIATION.
Dec. 14. Secy., D. W. Meeker, St. Par., Minn.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.
Dec. 20. Secy., D. Carhart, Carnegie Library Building, Allegheny.

ENGINEERS' CLUB OF CINCINNATI.
Dec. 20. Secy., J. F. Wilson, 24 W. 4th St.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.
Dec. 20. Atlanta, Ga., Secy., F. A. Charpiot, Macon, Ga.

CENTRAL RAILWAY CLUB.
Jan. 15. Secy., S. W. Spear, East Buffalo Iron Works, Buffalo, N. Y.

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D. McN. STAUFFER, A. M. WELLINGTON.....EDITORS.
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CHICAGO OFFICE: 1,636 The Monadnock.
CHAS. S. HILL.....RESIDENT EDITOR
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EUROPEAN AGENCIES:
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The compensation, or lack of compensation, of the engineer appears to be an increasingly frequent subject of discussion by engineering societies. As reported in another column, the Engineers' Club of St. Louis is to have a schedule of customary charges for engineers' services prepared by a committee of the club. The Canadian Society of Civil Engineers, at its meeting on Nov. 8, discussed the adoption of the following resolution:

> Whereas it is becoming the custom of certain small municipalities in Quebec and Ontario to seek gratuitous professional advice by asking engineers to submit plans and estimates without compensation, this meeting records its disapproval of members acting on such proposals as being unprofessional and against the interests of the society, engineers and the public at large.

The architects have done more, or at least attempted to do more, than any branch of the engineering profession in the way of fixing charges for services; but they appear not to be satisfied with what they have already accomplished. At a recent architectural meeting the project was broached that the practice of architecture should be controlled by law, and no one should be allowed to practice as an architect without obtaining a diploma for competency and artistic ability. Strange as it may seem, this proposal is said to have been approved by a considerable number of prominent architects.

The "Junior" grade of membership appears to be growing rapidly in favor in the Society of Mechanical Engineers. The quarterly ballot list of applicants for membership in that society shows the names of 26 applicants for full membership, and 22 applicants for membership in the junior grade. This is the largest proportion of applicants for membership in the lower grade that we remember to have seen among ballot lists, either in this society or in the Civil Engineers. According to the latest catalogues there are 242 juniors in the Mechanical Engineers and 255 in the Civil Engineers. The total membership in all grades in the Mechanical Engineers is 1,662 and 1,701 in the Civil Engineers. Thus the proportion of juniors is almost identical in the two societies. Of course the transfer of juniors to higher grades will always tend to keep down the numbers in this grade; but the indications are that the present proportion of juniors is likely to considerably increase in the future as the advantages of membership in this grade become better known to the younger members of the profession.

We noted in our issue of Oct. 18 the change of the Piedmont Consolidated Cable Ry. of San Francisco from a cable system to an electric system. The line has been in a receiver's hands for some time, and the bondholders petitioned the Court to permit the receiver to equip the line for electric traction, claiming that the change would save $7,000 per annum in operating expenses. An instance of a similar sort is now reported from Baltimore. The Gilmor St. cable railway in that city, owned by the Baltimore Traction Co., was completed and opened for business Aug. 30, 1892, barely two years ago, yet it is now to be altered to electric traction. The President of the company is reported as saying that the operating expenses of the road will be reduced $20,000 by the change.

As our readers know, it is a very short time since the question was much debated whether the total cost of cable or electric traction were the greater, and it was generally supposed that when the heavy first cost necessary in the construction of a cable road was once incurred, it was much the cheaper system to operate. Recent development, however, appear to show that, on lines of moderate traffic at least, electric traction is much cheaper than the cable, even though the expense of the conduit for the cable be left out of the account.

The wisdom of the managers of the St. Paul and Minneapolis street railway lines has been admirably vindicated by this outcome. Some three years ago they were about changing the principal lines in those cities from horse traction to the cable system, and a large amount of machinery for the cable system, aggregating nearly $500,000 in value, had been ordered and delivered. At this juncture the managers became convinced that electricity was the coming motive power for street railways, and the decision to install the cable system was rescinded. The cable machinery was disposed of for what it would bring, and the entire system was equipped with electric traction. Philadelphia is still another city in which electricity is supplanting the cable at a rapid rate. The Philadelphia Traction Co. has already altered a considerable mileage of its cable lines to electricity, and is continuing the work. In fact, at the present rate of progress, it appears likely that cable traction will soon be confined to the operation of railways over very steep grades, and railways in cities which continue to forbid the erection of overhead trolley wires.

In the morning papers of Nov. 8 there was a brief item which probably most of our readers failed to see in their interest in the mass of election returns. We, therefore, venture to reproduce the item verbatim:

> Plymouth, Mass., Nov. 7.—In the Superior Court this morning John C. Sanborn, Superintendent of the Plymouth Division of the New York, New Haven & Hartford Railroad, and Christopher T. Bailey, a railroad policeman, were each sentenced to four months in the House of Correction, and Angus L. Frazer, foreman of the Old Colony Railroad blacksmith's shop; Emery H. Bryant, roadmaster, and John Bolen, section foreman, were sentenced to two months each in the House of Correction for inciting and being implicated in the Abington riot in August, 1893. The defendants, acting in the interest of the railroad corporations, attempted to prevent workingmen employed by the electric railway from laying tracks across the Old Colony road.

Among all the various forms of lawless violence which have brought discredit on us in recent years perhaps none is more evil in its tendency than the riotous warfare in which great corporations have at times engaged. Most engineers of much railway experience know what a "crossing war" means, and know also with what disregard of law railway managers have set their employees to fighting the employees of rival corporations, and often on slight pretext. In several instances railway corporations have ordered their employees to engage in deeds of lawless violence; assaulting the employees and destroying the property of rival railways, and then, not long afterwards, these same aggressive corporations have suffered from the riotous acts of their own employees. You cannot teach a body of men that they may defy the law with impunity to aid you and still expect them to obey the law when the occasion comes to injure you.

It has been the well-nigh universal rule that the officers responsible for these crossing wars have escaped all personal responsibility to the law for their acts. Not only this, but, as a rule, the law has permitted corporations which have engaged in these unlawful proceedings to enjoy the fruits of their appeal to violence by retaining any strategic advantage thus gained. In no other case that we recall has the punishment which such acts justly invite been meted out to the offenders, and yet it is obvious that violence ordered by the general manager in his private office and carried out in the field by his higher officials, is, from every point of view, a worse offence against society than the hot-headed violence of unorganized mobs. It should, therefore, be punished everywhere with the full vigor of the law, as it just has been in Massachusetts. There will not be another "crossing war" in Massachusetts very soon, we may reasonably infer.

It must be clearly understood, of course, that we refer to the broad aspect of the case alone in the above statements. Whether punishment was meted out to the parties most deserving it in this especial case, we do not pretend to know. We may even go further, and say that the railways in the vicinity of Boston ought, in their own interest and the interest of the public, to exhaust every lawful means for opposing the establishment of further crossings of their lines at grades by electric railways. But no matter how meritorious their case, the appeal to force was unjustifiable and deserves punishment in the interests of law and order. Every one will feel sympathy for the unfortunate men who have to suffer the law's penalty for doing what other men have done in the past with impunity; but if they at all deserve the name of good citizens, they must recognize that it is time to call a halt in violence of this sort, and it is their duty to make amends for their fault by undergoing the penalty, as a warning to others who may later be tempted to commit similar unlawful acts.

In discussing the topic of co-operation among engineering societies in our last issue, we referred to the withdrawal of the Western Society of Engineers from the Association of Engineering Societies. Several correspondents call our attention to the fact that this withdrawal has not yet taken place, and that the question of whether the society shall withdraw is still to be decided by a letter ballot of the society, to be taken early next month. We are further informed through prominent members of that society that the sentiment among its members upon the question of withdrawal is by no means a unit, and that it is quite likely that the decision will be to remain in the association. The vote in the business meeting of the society which has been referred to as a vote of withdrawal was merely a vote instructing the Secretary to serve official notice on the Board of Managers, under which the society could withdraw at the end of this year if it so elected. The resolution instructing the Secretary to give this notice was only carried when it was so framed as to limit the action to the serving of this notice, and requiring a letter ballot to be taken for the final decision.

The puzzling thing about this whole matter to us is to discover any reason whatever for the proposed withdrawal of the society. The advantages of co-operation in the work of publication we fully explained last week, and we can see no reason why co-operation should be an advantage to the societies in Boston and St. Louis and Cleveland and other cities and still be a disadvantage to the Chicago society.

As nearly as we can learn, the real motive back of the agitation in the Western Society of Engineers is the attempts which some enthusiastic members have been making during the past year or so to "boom" the society. Just what form the boom should take has been a subject on which the sentiments of the aforesaid enthusiastic members have never fully settled; but there has been more or less of an expression that the time had now come when Chicago engineers should throw off the yoke of allegiance to the institutions of the effete East, and establish an engineers' society much bigger and better in every way than anything this continent, and perhaps any other, has ever seen. Whether to model this new society on the lines of the Institution of Civil Engineers of Great Britain, or the French Academy, or to form some society of international extent, appears to be a matter not yet settled.

The promoters of these ambitious schemes have

succeeded in making some noise and also in getting a considerable amount of time diverted from the proper work of their own society to the discussion of these projects. We have never given much space to the reports of these discussions, considering that the matter was of too little interest to the profession to demand much notice, and further considering that the reputation of the Western Society of Engineers, which counts among its members so many able engineers, would be needlessly injured by the publication of much of the foolish talk in which some of its members have indulged.

But now that these turbulent members have gone so far as to attempt to break off all connection with other societies, as a first step toward the formation of either a new national society or an international society, something may properly be said of these schemes. And that something is the plain statement that there is no room in this country for any rival national engineering society. There are now national societies of civil, mechanical, mining and electrical engineers, and several smaller national societies, each devoted to one especial branch of the profession. There is a little healthy competition between these societies, but each covers a different field from any other, and there is no real rivalry between them. Each and all of them are doing good and creditable work, not so good as they might do, perhaps—few things are done in this world so well as they might be done—but yet such good work as entitles them to the membership of engineers in the especial field of work to which the society is devoted. Each of these societies is organized on a democratic basis. It is governed by its members, under such rules as its members choose to make and follow, and, further, none of these societies are in any sense of the word local societies. Their headquarters are in New York city, it is true, but that is because the members prefer to have it so. It is open to Chicago engineers to secure the removal of the headquarters of any of these societies to that city whenever they can persuade a majority of the members that such a move is for the interest of the society. As for any local partiality in the distribution of the offices, that also is a matter which the members are responsible for, if it exists. As a matter of fact, Chicago engineers seem to have small reason to complain on this score. In the Civil Engineers, the present nominee for president is Mr. Geo. L. Morison, and yet Mr. Octave Chanute held the office only three years ago. In the Mechanical Engineers, Mr. R. W. Hunt filled the president's chair in 1891. So we might proceed at much length, but it is quite unnecessary, for any attempt to found a rival national engineering society on a platform of local prejudice would be doomed to certain failure.

We are glad to believe that much of the frothy talk at recent meetings of the Western Society does not at all represent the real sentiments of its representative members, and more for the sake of that society's reputation than for any other reason we hope that the letter ballot in the coming election will condemn the "I-am-better-than-thou" proposition.

The zeal and success with which Boston tries to protect the purity of its water supply is well illustrated by the final outcome of endeavors along this line at South Framingham, Mass., and might well put to shame Philadelphia, Allegheny, Pittsburg, Jersey City, Cincinnati and many other cities which are drinking their own or their neighbors' sewage, and even attempt to defend the practice. As outlined in our issue of Aug. 4, 1892, Boston has for many years, through the leadership of Mr. Desmond Fitz Gerald, M. Am. Soc. C. E., been striving to do away with all sources of contamination of the streams and ponds from which its water supply is drawn. Individual sources of pollution have been dealt with in a summary manner wherever detected, but the sewage of some of the towns in the Sudbury and Lake Cochituate watersheds was known to be reaching the streams and ponds more or less directly. Accordingly Boston offered to contribute towards the expense of sewerage systems, for some of the worst offenders, which would remove the sewage from its water supply. Local conditions have made sewage purification necessary at South Framingham, Marlborough and Westborough, where systems have been built, and also at Natick, which has been discussing the subject for some time, and at last seems to be about ready to go to work. The purification plants at South Framingham and Marlborough have proved to be models of their kind, land disposal being employed in each case.

At South Framingham a very wet soil was encountered, and to dry this, underdrains were put down in the sewer trenches. These underdrains discharged at a common point into Beaver Dam Brook, which eventually reaches the Boston water supply. The Boston authorities insisted that the underdrainage must be diverted from its water supply or purified before emptying into it, on the ground that it was subject to contamination from the sewers. In addition, the soil was more or less polluted from leaching cesspools and privies. Until one of these measures was adopted Boston refused to pay the promised $25,000 to the town of Framingham. The matter went on year after year, until a few days ago the town appropriated some $14,500 for the necessary works to filter the underdrainage, as set forth in detail in the note printed elsewhere in this issue. Upon the completion of these works and the diversion of the drainage to them Boston will pay not only the promised $25,000, but $6,000 additional.

What a lesson Boston sets by the above examples to the many cities now drinking water from sources known to be contaminated by sewage in more or less diluted condition, cities whose high death rates from typhoid fever should appal any civilized community and set it to providing, with all possible speed, some adequate relief. Boston has a low typhoid mortality, and one which has been steadily diminishing, while those of other cities have been increasing. The water which it uses is naturally quite pure, and, in addition to the great pains taken to prevent pollution, much of it is stored for months before use, a condition which tends greatly to reduce the danger from disease germs. Many of the cities drinking such grossly polluted water as has been mentioned are taking it while its foul matter is fresh and without any of the advantages of subsidence.

Certainly, if Boston objects to the underdrainage of a sewerage system, it is time for even the least progressive cities to make some move toward stopping long-established pollution of their water supplies by sewage itself.

HOW THE NEW YORK RAPID TRANSIT RAILWAY WILL BE BUILT.

As announced in our last issue, the favorable vote on the rapid transit question in New York city (53,000 to 19,000 in round numbers) means that a rapid transit railway will be built in that city and at an early day. Some newspaper items have stated that according to the terms of the law contracts must be let within 30 days. This is a forced interpretation of the law. The phraseology is:

> It shall be the duty of said board of rapid transit railway commissioners within 30 days after the official declaration of the said vote to proceed to construct the said railway or railways and to make and let all contracts required for the performance of the work necessary to be done and performed in and about the construction thereof.

When this is read in connection with other sections, it is plain that the section above quoted simply means that the commission shall "proceed" to construct the road; in other words, set about the preliminary work which must be got through before contracts can be let.

The actual course which the commission now intends to pursue, according to its own announcement, is to reconsider the whole subject and make any changes in the routes and extent of the line and in the general plan of construction which may seem advisable. One especial feature of these modifications will be the laying out of an additional route on the East Side, which shall better meet the needs of that crowded section of the city. These changes of routes will require a new procedure to obtain the consents of the property owners along the new lines, and while this is being done the engineering staff of the commission will be engaged in the preparation of detailed plans and specifications suitable for the use of contractors in the preparation of bids. By the plan which the old commission attempted to follow, of selling the franchise to the highest bidder, very general plans, showing only the type of construction proposed, were alone necessary; but under the new law which now controls the commission, the plans for the road itself must be made in detail, as for any other piece of engineering work which is to be put under contract. It will be remembered that the old commission adopted plans for four tracks on a level, and omitted to make any disposition of the pipes buried under the street surface. Probably the question whether a double-deck structure will not better suit the needs of the case, and whether some permanent disposition of the pipes beneath the street surface should not be made at the same time that the railway is built, will again come up for consideration. The law expressly provides that provision for subways or tunnels for sewer, gas or water pipes, electric wires, etc., may be included in the plans, if the commission deems best.

When routes and plans are adopted, and detailed drawings and specifications are made, the commission will proceed to let the contract for construction, advertising such letting at least three weeks. While the law permits the contract to be let as a whole or in parts, it expressly says that the contractor for the construction of the road shall also be the contractor for operation, "who shall, at his own expense, equip, maintain and operate said road or roads for a term of years to be specified in the contract, but to be not less than 35 nor more than 50 years." Practically the evident intent of the law is that one contractor shall agree to build the road for a certain sum of money, to be paid him by the city, and shall also agree to operate the road as lessee after completion, and to pay a certain sum of money to the city as annual rental. As the total cost of the road is supposed to be from $30,000,000 to $50,000,000, it will be seen that this contract will be for an engineering work of greater magnitude than any now in progress in the world, so far as we now recall; and there are few instances on record where a single contract has involved such an enormous sum.

Nevertheless, it is fair to say that the risk involved in the contract is not, or need not be, proportioned to the magnitude of the work, and is, or may be, well balanced by the opportunities for profit which the contract offers.

The contractor must in the first place deposit $1,000,000 as a guarantee of faithful fulfilment of his contract—not an excessive deposit for a work of such magnitude, and he is to receive interest on the deposit, moreover, while it is in the city's hands. He must in addition give bonds for such amounts as the commission shall prescribe. He will receive payments as the work progresses, as in any contract, and will have the satisfaction of knowing that the city's credit is as good as the Bank of England, and he will be absolutely certain of his money when pay day comes around.

Besides his million-dollar deposit and his bonds, the contractor must have capital sufficient to prosecute the work, and must, in addition, at his own cost, furnish the rolling stock and equipment for the road, which probably means power-houses for electrical operation, as well as the rolling stock, machinery and operating equipment generally. The city has a first lien on all this equipment, in addition to the bonds and the deposit, to protect it against default by the contractor.

Let us turn now to the operation of the road. The contractor will practically have a lease of the road, and is to pay a rental per annum, which must not be less than the interest on the bonds which the city issues to pay the cost of construction, plus 1% on said bonds. Of course the commission will get as much higher rental than this as it can induce the contractor to pay.

It will now be plain why the framers of the law provided that the contractor who builds the road must also operate it. If the contractor bids an excessive price for the construction, he will have the interest on that price to pay as a rental anyway, so that while he may possibly make several million dollars profit on the construction, he will have to pay the interest on this cost, and in the long run the principal as well, the extra 1% forming a sinking fund to pay at maturity bonds issued by the city to build the road.

Thus the contractor has as an incentive to put in a low bid not only the knowledge that some one may underbid him, but also the knowledge that if the contract is awarded to him at a high figure he may indeed make a great profit on construction, but may, perhaps, have to take part of that profit to pay a portion of the rental.

Again, having once taken the contract, it will be manifestly for his interest to see that it is carried out in a thorough and permanent manner. Any scamping which may lessen in any degree the safety of the road, or its attractiveness to the public, or which may increase, in any degree, the cost of operating it, will be as manifestly against the contractor's interest as if he were building the road for himself. The city has therefore peculiar assurance, first, that the road will be built at a reasonable cost, and, second, that it will be well built. The deposit and bond, and the capital which the contractor will have to invest in equipment, are probably sufficient guarantee that the contractor will not undertake to reap a huge profit from the building of the road and then attempt to evade the responsibility of operating it.

Still further, it will be seen that in the operation of the road the contractor will have every incentive to give such a service as will attract traffic and also to operate it in the most economical manner. His annual profits will depend upon his success in attaining both these ends.

It will thus be seen that the framers of the law have, in an admirable manner, made it for the contractor's interest to carry out his work in the manner most advantageous to the city. It now rests with the rapid transit commission to devise such details relative to the construction and operation as shall make the contract attractive to capitalists, and thus secure sufficient competition among responsible parties for the contract to be let at a moderate figure.

After these details are decided upon we may have more to say respecting the inducements which the enterprise holds out to investors. Of course the point which is most difficult to decide upon is whether the earnings of the new road will be sufficient to pay the expenses of operation and the annual rental. We may note here, as a matter of interest in this connection, that the elevated and surface railway lines now in existence in New York city earned $24,232,000 in the year ending June 30, 1893, and $22,428,000 in the following year. The Manhattan Elevated lines alone earned $11,086,000 gross in 1893, and their operating expenses were only $6,220,000, leaving (with their income from other sources than passengers) over $5,000,000 net earnings, or 5% interest on $100,000,000. If the new rapid transit road costs the full amount of $50,000,000, the rental which will have to be paid if bonds are floated at 3% will be only $2,000,000 per annum, which, it will be remembered, includes a sinking fund payment for the extinguishing of the bonds when due.

On the plan which the old commission unsuccessfully tried, of inducing private capital to undertake the entire enterprise, investors would have certainly required a reasonable probability of 6% to 7% being earned on the cost of the road to induce them to undertake the work. In other words, the interest charges of the company operating the road would be double or more what they will be on the plan which is now being followed. Bearing these facts in mind, the prospects of profit to the contractor are such as should secure the attention of capitalists and contractors in all parts of the world.

LETTERS TO THE EDITOR.

THE ASSOCIATION OF ENGINEERING SOCIETIES.

Sir: In your editorial in your issue of Nov. 8, setting forth the advantages of co-operation in the work of the Association of Engineering Societies, you refer to the withdrawal of the Western Society of Engineers from that Association as an accomplished fact, whereas the matter is still under discussion.

Many members of that society felt that its importance is such that it no longer stands in need of the facilities offered by the Association, and a movement was accordingly set on foot to secure the withdrawal of the society at the end of this year.

In order, however, that the society should be at liberty to withdraw at that time, it was necessary, by our articles of association, that three months' notice should be served upon the Association. It was accordingly voted, at the meeting of the society held on Sept. 19, "that the secretary be instructed to serve notice of the withdrawal of this society from the Association of Engineering Societies as a temporary expedient, and that a letter ballot be ordered to be canvassed at the December meeting."

While, therefore, formal notice was thus served in time to provide for the withdrawal of the society at the end of this year, if that is found desirable, it is possible that the society may find it to its advantage to continue its co-operation with us.

Yours truly, John C. Trautwine, Jr.,
Secy. Association of Engineering Societies.

Philadelphia, Nov. 9, 1894.

PUMPING ENGINES OF LARGE CAPACITY.

Sir: I notice an error in your issue of Sept. 27 on your first editorial page, where you state that certain engines at Rotterdam and London were made by H. R. Worthington.

Messrs. Jas. Simpson & Co., Pimlico, London, built five Worthington engines for the Rotterdam municipality for pumping sewage; three, each of 18,000,000 U. S. gallons and two of 3,600,000 gallons. They also built for the West Middlesex Co., of London, two engines, each of 26,000,000 gallons, and a large number of 25,000,000 gallons capacity.

I beg to hand you a report of one of the latest erected here at "Hornsey Sluice." I do not remember seeing any better result in the Engineering News.

J. T. Rodda.
Inspector Eastbourne Water-Works.

Woodbank, Grove Road, Eastbourne, England, Oct. 24, 1894.

(Jas. P. Simpson & Co. are the agents for the Worthington engines in England, and construct the same at their works. Our authority for the statement that 30,000,000-gallon Worthington engines are in use at Rotterdam and London was the Worthington catalogue. The report sent by Mr. Rodda relates to a test of a triple-expansion high-duty Worthington pumping engine erected by James Simpson & Co., for the New River Co. The test was made July 24, 1894, by Prof. Alex. B. W. Kennedy. It showed a duty of 124,500,000 ft.-lbs. for 100 lbs. of coal consumed, which, while a high duty, has been surpassed by pumping engines in this country. The mechanical efficiency of the engine, or ratio of HP. to I. HP., was 84.4%.—Ed.)

WHY PADDLE-WHEEL VESSELS "BURY THEIR BOWS" WHEN UNDER HEADWAY.

Sir: I was pleased to note in your issue of Oct. 11 a substantial agreement between Colonel Stevens and myself as to one cause of the "burying" of paddle-wheel boats when under headway. There is, however, still another reason for it to be found in that action of the wheel which draws down the water in front of it while it piles it up behind, and the boat of course inclines to conform to the slope of the water surface. In a screw vessel, on the contrary, the piling up of the water is less than with the paddle, and is too far aft to have any effect on the boat whose stern inclines to "squat" in the hole dug by the screw.

H. W. Brinckerhoff.

New York city, Nov. 10, 1894.

CONCERNING THE TITLE "CIVIL ENGINEER."

Sir: I was not a little amused at the position taken by your correspondent "C" in your issue of Oct. 11, regarding the title "C. E." "C" must be very unfamiliar with the proper means of conferring the title to malign it at wholesale as he has done. Our best technical schools do not confer the title upon a large number—perhaps a majority—of their graduates. It is granted only after the candidate has proved himself worthy of it by a period of successful practice, and has handed in a thesis showing more than ordinary ability, or has taken advanced examination before competent critics. Such an ordeal passed, the candidate merits the degree, and it means something to him and for him.

It is doubtless true that many surgical operations could be performed by those who for some reason have failed to secure the degree of M. D., but it is rather pleasant for the patient to know that the man who is operating on him has won the distinction indicated by the title, and that he is not in the hands of an untrained quack. So let the great scientific schools continue to recognize the ability of their graduates by conferring a title that cannot possibly harm any one, and which carries with it a real meaning and usefulness.

R.

Youngstown, O., Nov. 3, 1894.

PARABOLIC RAILWAY CURVES.

Sir: The writer would like to offer the following note on the use of parabolic curves. He has been using them with success for electric railroad work during the past season and has found them very convenient. The method of use is as follows: The points of curve are decided upon, with equal or unequal tangents, as is most suitable, and the point of intersection is found as for an ordinary circular curve. The two tangents are each divided into, say, four equal parts, and with the instrument set at the point of intersection, pins are lined up along both tangents. The instrument is then set up at one point of curve and sighted to the other. At the middle of this chord a rod is set in line. This completes the instrument work. The distance from the middle of this chord to the point of intersection is then measured, and the middle point thereof is a point of the curve. The other points are determined by measuring offsets from the tangents, varying as the square of the distance from the point of curve. In our example this would give the following offsets, calling d the half distance from the middle of the chord to the point of intersection: For the first, 1-16 d; for second, 4-16 d, and for the third, 9-16 d. The offsets are the same for both tangents, and are measured in a direction parallel, as near as may be judged by the eye, to the line joining the center of the chord and the point of intersection; that is, parallel to a diameter of the curve. The above division of the tangents into four equal parts each is the most convenient for ordinary electric railway practice. A curve of this kind has the great advantage, from the nature of the parabola, that it is eased off at the ends, and consequently rides very smoothly. Another advantage is that lengthy calculation or the use of a book of tables is not required.

C. M. B.

Media, Pa., Oct. 5, 1894.

ICE IN A LOUISIANA SEWER TRENCH.

Sir: Your letter of Oct. 26 in regard to the finding of ice in this place, at a depth of 14 ft., has been received. In reply, I will state that on Oct. 18 last, while making excavation for a sewer, one of the laborers dug up a piece of ice, about the size of a hen's egg, at a depth of 14 ft. below the surface. The locality is at the intersection of St. Philip St. and North Boulevard, in the city of Baton Rouge, La. The foreman, who was standing over the laborers at the edge of the ditch, saw the ice shining in the bottom and asked what it was. One of the laborers said that they were "digging up ice down there," and picked up a small piece which had been broken off with the spade and handed it to him. The foreman then brought it to me and told me where he had gotten it.

The point at which the ice was found is 5 ft. above high water in the Mississippi River, while the natural surface there is 19 ft. above high water. The soil is a reddish clay down to a depth of 13 or 14 ft.; below this it is a white, hard material strongly impregnated with lime, impervious to water, but slaking or crumbling rapidly upon exposure to air. This is the highest point in Baton Rouge, and is the top of the chain of hills which touch the Mississippi River at this place and extend back through Louisiana to Lake Pontchartrain.

The popular belief in Baton Rouge is that some practical joker buried a piece of ice the night previous in this place, in order to create a sensation, knowing that it would be dug up the next day.

This theory is untenable, because the ground showed no signs of having been disturbed and several spadings had been taken off just before the discovery. At this depth there is quite a lot of water in the ground, and for two or three days previous the laborers who were digging at the same depth about 60 or 70 ft. away complained that the water was very cold.

Respectfully, S. H. Lea,
Engineer in charge of work.

THE "OTHER SIDE" OF TRACING LINEN.

Sir: I notice in your issue of Nov. 8 that when tracing cloth does not take the ink readily, you advise rubbing with powdered pumice stone to remove the difficulty. It will remove the difficulty, and the pen points as well. No gritty substance should be used for such a purpose. Prepared chalk, potter's clay, talcum, or some similar smooth powder, answers much better. It should be applied much as our stepmothers used to butter our bread, that is, take off more than you put on, if possible; otherwise the powder is liable to clog the pen.

As to the other matter, I always have tracings made on the dull side of the cloth, first, because erasures or alterations are less noticeable than on the glazed side; second, because the light reflected from the glazed side is more trying to the eyes, and sometimes makes it more difficult to see the drawing below; and, third, because it is often convenient, especially in alterations, to work in pencil on the tracing, which is almost impossible to do on the glazed side.

As to prints, there is certainly no difficulty in getting excellent results from tracings made on the dull side, though I can understand that, with fine lines on thick cloth, the dull side, if next the sun, might cause more diffusion of light beneath the lines, and so prevent the shadows, and hence the print, from being so sharp. It is, however, hardly worth while to discuss a matter that can be so easily tested. H. W. Brinckerhoff.

New York, Nov. 10, 1894.

IMPACT ON BRIDGES.

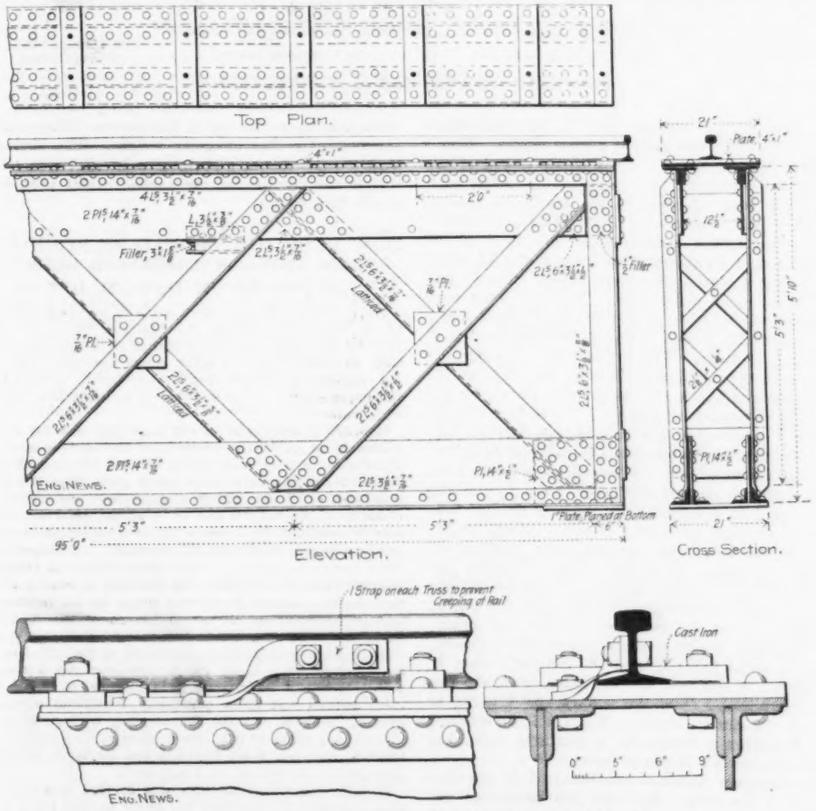
Sir: I send you herewith details of rail connection and a partial elevation of one truss of Bridge No. 2 on the Boston & Maine R. R., as an example of a bridge

which has the rail resting directly on the metal work of the structure. The bridge is a four-track jack-knife drawbridge, about one-half mile north of the Union Station, and carries all passenger trains of the Fitchburg R. R. and the Eastern and Western Divisions of the Boston & Maine R. R. The trusses are of the double-intersection, riveted-lattice type, having a maximum length over all of 95 ft. and continuous over an intermediate support. The bridge has been in use for 14 months, and as yet no report of loose rivets has reached this office; neither is the bridge a particularly noisy one to ride over. Other roads entering Boston have had similar structures in use for several years, and we felt that we were following a well-established precedent in making this design. Yours respectfully,

B. W. Guppy, Asst. Engr. B. & M. R. R.

Boston, Mass., Oct. 16, 1894.

(The construction shown by our correspondent's blueprints (reproduced in the accompanying cut) is very interesting, and seems to be good evidence that, under such conditions as those existing in this structure, the truss is able to absorb the impact of trains without injury. It will be seen that the impact in this case is conveyed to the trusses much more directly than in the Archer Ave. bridge, illustrated in our issue of Oct. 18. In that structure the deflection of the trough floor and the inertia of the ballast load on it are probably adequate to absorb



Enlarged Details of Top Chord and Rail Fastening.

RIVETED TRUSS DRAW-SPAN, BOSTON & MAINE R. R.

most of the impact before it reaches the trusses. On the other hand, the Archer Ave. bridge would probably be a noisier structure than the bridge shown in the accompanying cuts. Reference to the illustrations of the Archer Ave. bridge will show that there is a continuous steel plate, 18 ins. wide and ½ in. thick, under each rail. This plate is unsupported, of course, over each trough, and experience with the old-fashioned flat tie plates and with some types of rail joint has abundantly proved that a metal plate placed under a rail and not held firmly to the rail or tie is very apt to ring and clatter under a train.

In connection with this matter of the effect of impact on railway bridges, we note with interest a letter from a railway superintendent, published in a recent issue of "The Railroad Gazette." The writer says:

Did you ever note that the bridge seat coping in nearly all small bridges and in many large ones, is cracked under the wall plates, and the effect of the failure of the bridge seat tends to crack and destroy the masonry? It is a fact, and I have concluded that no bridge seat coping should be less than 24 ins. thick. Some years ago I found some plate girder bridges of 50 or 60 ft. span, I forget which, that had the girders blocked up on timbers which had become necessary on account of the tracks having been raised several inches. I considered this a shiftless job, and immediately ordered cast iron wall plates, high enough to replace the timber blocking. At that time the masonry was in good condition. After the cast iron wall plates were put in, the masonry immediately commenced to go; the bridge seats first, and the upper courses later, and in a short time it became necessary to rebuild much of the masonry. This is only one instance of many.

As we pointed out in a recent issue, it might reasonably be expected that a wood cushion would have an important effect in reducing the strains due to impact. The above letter appears to show that this is actually the case in practice; and that more attention should be paid to the matter of impact on small bridges, where the inertia of the structure itself is not great enough to have an important effect in reducing the shock.—Ed.)

Sir: In your issue of Oct. 11 you ask for information with regard to any railway bridges where the rail rests directly on the metal work.

The New York & New England R. R. has a bridge over the New York Central & Hudson River R. R. at Fishkill-on-Hudson, in which the rails rest upon a floor made of old rails. The bridge was erected seven or eight years ago. Yours, H. C. Keith,

Asst. Bridge Engineer, N. Y., N. H. & H. R. R.

New Haven, Conn., Oct. 26, 1894.

THE AIR-BRAKE PATENT DECISION.

Sir: Is it not possible that in reviewing the recent Court of Appeals decision in your issue of Oct. 25, in the matter of Westinghouse vs. the New York Air-Brake Co., you may have failed to get the full scope of the decision, or at least unintentionally have given your readers an interpretation of it not warranted by the facts? We think so, at least, and hence appeal to your sense of fair play to lay before your readers the New York Air-Brake Co.'s version.

'Tis true, and is conceded by the New York Air-Brake Co., that the highest court has by this decision determined the Westinghouse patent 376,837 to be valid, but nevertheless it is equally true that it is limited to auxiliary reservoir pressure. As the New York Air-Brake Co.'s valves at the time this suit was begun, and up to Judge Townsend's decision, were operated by auxiliary reservoir pressure, such New York Air-Brake Co.'s valves were held to infringe, and the injunction granted by Judge Townsend remains in force. But in relation to 448,827, the contention was for an emergency valve not controlled at all by the triple valve. This patent was declared void, not, as you state, because it is fully covered by 376,837 (the language of Judge Shipman can only be so tortured by parties in interest), but because 448,827 was originally in 376,837, and was extracted from that and made the subject of another patent, 448,827, and which Judge Shipman says is only another form of 376,837, i. e., another way of operating the emergency than in 376,837, but limited as in 376,837 to auxiliary reservoir pressure. Hence it must follow that a valve such as the New York Air-Brake Co. has been making since Judge Townsend's decision, operated by train-pipe pressure, is by the Court of Appeals decision free and clear from the only patent, 376,837, sustained for the Westinghouse Co.

Bear in mind that the Park patent, which operated by train-pipe pressure, and which patent had been purchased by the Westinghouse Co., was part of the suit, and it was under the Park patent that the Westinghouse Co. had hoped to cover train-pipe pressure, which the New York Air-Brake Co. uses to actuate their present mechanism. This was decided by Judge Townsend in favor of the New York Air-Brake Co., and was sustained by the Court of Appeals.

Much stress is also laid upon the decision vs. the New York Air-Brake Co. on the engineer's valve, which is another bold attempt to intimidate railways from buying the goods of the New York Air-Brake Co., whereas the decision of Judge Townsend, sustained by the Court of Appeals, is the very bulwark upon which the New York Air-Brake Co. rests their claim that their present engineer's valve is entirely free from all contention of infringment. The engineer's valve in suit was a failure, and was discarded by the New York Air-Brake Co. soon after suit was commenced. The present standard engineer's valve has been in use for nearly three years, and is not the subject of any litigation whatever, and the Westinghouse people know that fact very well.

The result to any fair-minded and intelligent person conversant with air-brakes of a careful reading of the decision of the Court of Appeals will be to convince him that the present valve of the New York Air-Brake Co. is absolutely free from any of the patents which were involved in the case just decided by the Court of Appeals, and that the New York Air-Brake Co. is free to make it, and the railways to use it.

The New York Air-Brake Co.

(Our correspondent says we stated that patent 448,827 was declared void because it was fully covered by 376,837. This is a mistake. Evidently he did not read our editorial statement carefully. What we did say on this matter (issue of Oct. 25, p. 346) was:

The subsequent patent to Westinghouse, 448,827, he (the Judge of the Court of Appeals) holds to have been not sufficiently different from the patent already obtained by Westinghouse (376,837) to constitute a patentable invention. To quote from the decision: "It was simply what the patentee first deemed it to be, a form of the invention of that patent and covered by it.

Our correspondent will thus perceive that the statement that 448,827 is "covered" by the broad patent 376,837 is Judge Shipman's statement, quoted by us verbatim, and not our own.

Concerning the New York Co.'s claim that the valve which it is at present making does not infringe the Westinghouse patents because it is operated by train-pipe pressure, it should in fairness be stated that this valve was not in the suits which have just been concluded, and hence was, of course, absolutely outside the purview of the judge in writing his decision. The Westinghouse Co. has brought a separate suit against the New York Co. for infringement of its patents by this valve, and after that has come to trial and been decided the public will know better whether this valve infringes or not.

It is of interest to learn, however, that the New York Co. proposes to rely on operating the emergency valve by train-pipe pressure as a defence to the charge of infringement of the Westinghouse patents. Concerning this it should be said that the Park patent, to which our correspondent refers above, was not declared invalid by Judge Shipman, but was merely held not to prevent the use of New York valves which were operated by auxiliary reservoir pressure. Whether it or other patents owned by the Westinghouse Co. will prevent the use of the latest New York valve, operated by train-pipe pressure, is something which will be known later.—Ed.)

THE PRESENTATION OF THE BESSEMER MEDAL TO JOHN FRITZ.

Mr. John Fritz, M. Am. Soc. M. E., of Bethlehem, Pa., was, on the evening of Nov. 8, formally presented with the Bessemer gold medal, awarded to him by the British Iron and Steel Institute as an evidence of the appreciation by that body of his services in developing the art of manufacturing iron and steel. The presentation was made by Mr. E. Windsor Richards, President of the Institute and manager of the famous Lowmoor Iron Works, who is now in this country. On the evening in question a number of prominent engineers, owners and managers of iron works tendered Mr. Richards a dinner at Sherry's, in New York city, both in recognition of his well known professional ability and in return for his courtesy to the Americans present at the Brussels meeting of the Institute. The visit of Mr. Richards to the United States was in part to enable him to present this medal to his warm personal friend, and his speech of presentation was a hearty and kindly recognition of the genius and indomitable energy and patience of Mr. Fritz as an engineer, and a loving tribute of respect and regard for him as a friend of long standing.

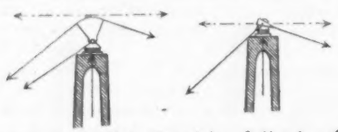
The honorable record of Mr. Fritz is known to every American who has watched the development of our iron and steel industry, for Americans owe much to him in that direction. In his early career, in building up the Cambria Iron Works, he first introduced the three-high roll system, and now in universal use all over the civilized world; and his subsequent labors in originating and bringing to its present magnitude the great steel plant at Bethlehem eminently entitles him to the honor conf[illegible] by the Iron and Steel Institute. With characteristic modesty, Mr. Fritz, in accepting the medal, said that he did not deserve it for what he had done, but he would accept it for what American engineers, with such aid as he could give, had done for the iron and steel industry in this country.

Over a hundred guests were present at the dinner, which was presided over by Hon. Abram S. Hewitt, and speeches were made by representatives of all the leading engineering societies of the United States. At the close all present joined in a hearty wish for long life and prosperity for Mr. Fritz and Mr. Richards.

We believe this is the third instance of the award of the Bessemer medal to an American. The first and most deserving recipient was the late Alexander Lyman Holley, and the award was made almost simultaneously with his untimely death. The second award was to Hon. Abram S. Hewitt, in 1890, on the occasion of the visit of the Iron and Steel Institute to this country.

A NOVEL DETAIL FOR SUSPENSION BRIDGE CABLES.*

The design to which the first prize was awarded in the Budapest bridge competition (Eng. News, June 28, 1894) was for a stiffened suspension bridge, with a length of span c. to c. of towers of 1,036 ft. 9 ins. and a versed sine of cable of 90 ft. 2 11-16 ins. There would be two suspension cables, each 19 11-16 ins. in diameter and containing 397 strands of 37

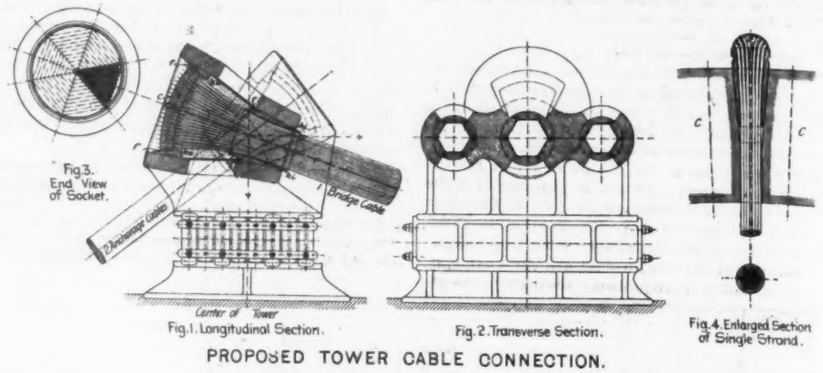


Diagrams Illustrating Principle of the two-Cable Systems.

wires each, or 14,689 wires in all. The wires would be of hard steel, 5-32 in. diameter, and laid parallel. The length of the stiffening truss, between supports, would be 1,026 ft. 11 ins. and its depth would be 18 ft. 8 ins. at the center and 24 ft. 3 ins. at the sides. The cables and hangers are swung in inclined planes. The cables are 78 ft. 9 ins. apart c. to c. at the towers and 60 ft. 11 ins. apart at the center of the span. The stiffening trusses, however, are in vertical planes. They are inside the hangers and placed 55 ft. 11 ins. apart c. to c. Inside the trusses are two sidewalks, each 9 ft. 10 ins. wide, and a roadway 32 ft. 9¾ ins. wide. The hangers are spaced 9 ft. 10⅛ ins. apart and they carry the floor beams, which are connected to the stiffening truss at the main and sub-vertical posts.

The designers have submitted two plans for the arrangement of the cables over the towers, in one of which it is proposed to abandon the usual method of carrying the cables continuously over a saddle, and instead of this to stop the suspension cable at the towers and introduce two anchor cables at each end. This feature has excited much interest among German engineers, and as described as follows:

Figs. 1, 2 and 3 represent the tower-bearing with



PROPOSED TOWER CABLE CONNECTION.

its three conical sockets, one for the suspension cable, the other two for the anchor cables. Fig. 4 shows, to an enlarged scale, a single strand of the cable passing through the cap piece C. After each wire has been stretched to the maximum tension which it will receive later in the bridge, the end is passed through a corresponding hole in a sleeve and fastened temporarily until all of the 37 wires composing a strand have been passed through and gathered in the right order. They are then held together on the other side of the sleeve by a screw clamp, and the strand is brought into its final position in the cable. This is done by drawing the strand through the tower-bearing and through its corresponding hole in the cap piece C, which, for the time, is suspended by pulleys. The ends are again clamped together on the outside, carefully cut off, and finally a conical bushing is introduced, as shown in longitudinal section. After all the strands have been fastened in their respective holes in the cap piece, as just described, the cable is pressed into cylindrical shape by means of screw clamps, beginning at the middle of the span and working towards both ends. It is then wrapped closely and tightly with wire ⅛ in. in diameter and the clamps which fasten the hangers to the cable are put in position. When the ends are reached, the tower-bearings and conical sockets are finally adjusted, the soft metal lining, f, and the interior wedge, k, are placed in position, and the cable, with the cap piece, is released from the pulleys and brought to bear in the conical socket. When it is ascertained that the interior wedge K_I is perfectly tight, the outside wedge K_A is put in place.

The designers submit a calculation of the strength of such a fastening. Both the cap pieces and the conical sockets are supposed to be of hard steel and the wires are to have an ultimate resistance of 199,000 lbs. per sq. in. and an elastic limit of 99,500 lbs. It is believed that a careful adjustment of the wedges and the introduction of soft metal lining between the cap and the outside wedge will tend to a fairly even distribution of the pull in the cable. An element of strength is also to be found in the curved conical shape of the cable inside the socket, which shape is made permanent by finally pouring molten lead into the interior. The lower and upper ends of the conical socket are closed by strong metal plates. It is an essential condition that the ends of the strands in such a fastening should be readily accessible for inspection. Moreover, the method of fastening must be sufficiently cheap and entirely reliable, all of which requirements appear to be fully met in this instance.

The two anchor cables must, of course, be in their positions in the conical sockets before the suspension cable is hung. They are placed so that their horizontal projections are parallel to the direction of the suspension cable ends. Each anchor cable is 15¾ ins. in diameter. In the alternative design, where the cable is carried in the usual manner over a rocker saddle on top of the tower, and anchored in the abutment wall, a supplementary anchor chain is introduced, extending from the anchorage alongside of the cable to the pivot of the rocker, where it is fastened, the object of this being to secure vertical loading of the saddle. Both the anchor cable and supplementary chain are normally in a vertical plane, while the suspension cable, it will be remembered, lies in an inclined plane, a circumstance necessitating the introduction of extra transverse bracing at the top of the towers. The rocker segments are also of great weight. The cost of such a supplementary chain of mild steel would be double that of one of the anchor cables proposed in the first design.

*Translated from the Proceedings of the Society of Austrian Engineers and Architects, by O. J. Marstrand, M. Am. C. E.

HOW MUCH SOIL SHOULD BE STRIPPED FROM STORAGE RESERVOIR BEDS.*

By Prof. Thos. M. Drown, M. D.**

Many statements have been made in previous reports of the Board concerning the injurious effect on impounded water of the organic matter in the bottoms and sides of reservoirs, and great stress has been laid on the importance of removing all vegetation, as well as the upper layers of the soil before filling a new basin with water.[1]

In order to determine in any case just how far it is necessary to go in the removal of the surface soil, a knowledge of the composition of the soil, based on chemical analysis, is a much surer guide than the unaided eye. It is not merely a question of the effective cleaning of the bottom and sides of the reservoir, but also of avoiding the expense involved in stripping the soil to a greater depth than is necessary. In connection with the investigations of the State Board of Health relative to a water supply for the city of Boston and its suburbs, surveys have been made for an immense storage reservoir on the south branch of the Nashua River above Clinton, and it was thought desirable that a thorough knowledge of the character of the soil should be obtained as a basis for determining the amount which it would be necessary to remove to obtain a clean bottom and sides practically free from organic matter. Samples of soils, representing sections of the ground to a depth of 3 ft. were taken at nine places in Clinton, Sterling, West Boylston and Boylston, and in one case at the bottom of a mill-pond.

Each of these nine sections was divided into six or seven samples for analysis, the upper portion being divided into thin layers of 2 to 3 ins., the lower portions, with less organic matter, into layers of 6 to 12 ins. in depth.

The amount of organic matter in these samples was determined, after careful drying to a constant weight at 100° C. (212° F.), by heating the samples to a bright red heat. The loss on ignition thus obtained represents approximately the organic matter in the samples. But in order to get a better knowledge of the character of this organic matter, the amounts of carbon and of nitrogen were also determined in each sample—the former by combustion in oxygen, the latter by the Kjeldahl method.

The results obtained in the analyses of the nine sections of soil and the deposit from the bottom of the mill-pond are given in the accompanying tables. The largest amount of organic matter found was from a swamp at the head of the Boylston Mill Pond—(the analyses for this series only are presented herewith in the

*Slightly condensed from the Report of the Massachusetts Board of Health for 1893. All but one of the ten tables are omitted.

**Chemist of the Massachusetts State Board of Health.

[1] Compare Special Report upon the Examination of Water Supplies, Massachusetts State Board of Health, 1890, pages 748, 772, 773; report for 1891, page 384.

Analyses of Soil from a Swamp at the Head of Boylston Mill Pond and Effect of Soil Upon Water.

	Analyses of Soil. All Samples dried at 100° C. (212° F.) —Per cent.—				Sanitary Analyses of Water After Heating to 147° F. with Soils in it. —Parts per 100,000.—					
Depth of samples below surface, inches.	Loss on ignition.	Carbon.	Nitrogen.	Ratio carbon to nitrogen.	—Free ammonia,— After heating to 147° F.	After standing one week.	Albuminoid ammonia.	Oxygen consumed.	Color with distilled water.	Effect on color of Cochituate water of color 0.55
0 to 2	22.31	12.53	0.96	13.0	0.1360	0.4000	0.4970	6.4000	0.40	0.70
2 to 4	24.59	13.05	0.54	24.2	0.1486	0.5429	0.4486	7.4286	0.50	0.90
4 to 8	17.12	8.75	0.86	10.2	0.1360	0.3440	0.4970	4.6000	0.12	0.55
8 to 12	9.14	3.96	0.21	18.9	0.0274	0.0709	0.0937	2.7429	0.50	1.00
12 to 21	3.93	1.44	0.09	16.0	0.0305	0.0267	0.0438	1.0857	0.30	0.70
21 to 39	1.98	0.51	0.04	12.8	0.0173	0.0220	0.0502	0.8471	0.10	0.55
39	0.66	0.06	0.00	0.0	0.0179	0.0245	0.0080	0.1365	0.02	0.45

accompanying table.—Ed.)—and the next largest in amount from the hillside near the site of the proposed dam. The other series, from very dissimilar ground, did not differ very widely in the amount of organic matter present, although they included both unwooded and uncultivated land and wooded and manured pasture land. But in all the series there is usually a rapid falling off in the amount of the organic matter below a depth of 9 to 11 ins. At the depth of 3 ft. the amount of organic matter, as shown by the loss on ignition, in no case reaches 2%, and in the majority of the cases it is below 10%. The mud taken from the bottom of the Mill-Pond at different points contained very variable amounts of organic matter, from almost nothing at one place in the shallow portion to nearly 15% in the deeper portion.

It was thought that the relation of the amount of nitrogen to the amount of carbon in the organic matter might throw some light on its character and its likelihood to undergo decomposition. This relation is given in the column giving the ratio of carbon to nitrogen. The only series in which the nitrogen ratio is noticeably higher than the rest is the one No. 5, from low pasture land. Series Nos. 4 and 6, both from hillsides, show a noticeably high carbon ratio, and the others are not very dissimilar in their proportion of carbon to nitrogen.

An attempt was made to imitate the conditions which would obtain if the reservoir should be filled with water without removing the soil, in order to determine what would be the effect of each of the soils examined on water in contact with it. It is obvious that no laboratory experiment could exactly reproduce the conditions which would exist in a reservoir. Thus it would not be easy to imitate the period of long stagnation of the water during the summer, when the deeper layers of the water are in contact with the soil, without an opportunity to get a fresh supply of oxygen from the air. Still it was thought that some idea of the effect of the different soils on the water could be obtained by treating the samples with water for a definite time, and then examining the solutions thus obtained with respect to the character of the organic matter dissolved. In order to hasten the action of the water on the soils, it was heated to 65° C. (147° F.), and the time of contact at this temperature was six hours. The waters were then filtered and the filtrate examined by the usual methods used in the sanitary analysis of water. After standing one week the waters were again tested for free ammonia, to ascertain the amount of decomposition which had gone on in this time, thus obtaining information as to the character of the organic matter dissolved. The actual amounts of organic matter found in these solutions, as indicated by the albuminoid ammonia and oxygen consumed, are not especially significant, since they would probably have been very different if another temperature or a greater or less time of treatment had been adopted. But a comparison of the amounts dissolved from the soils in each series, and a comparison of the series with each other, yield information as to the relative facility with which each of the samples examined give up organic matter to water with which it comes in contact.

In comparing these tables of analyses of the waters with the corresponding tables giving the percentage determinations of loss on ignition, carbon and nitrogen, a general agreement will be noticed; that is to say, the samples containing the most organic matter give as a rule the most concentrated solutions of organic matter. But the analyses do not indicate more than a very general correspondence of this kind. The amount of decomposition going on in these solutions, indicated by the increase of free ammonia on standing one week, is, in general, also proportional to the amount of organic matter present. The most noticeable increase in the free ammonia is generally in the solutions prepared from the surface samples. In solutions from the deeper samples there is generally a decrease of free ammonia, indicating doubtless its oxidation to nitrates. The samples from the bottom of the Mill Pond give solutions which have little or no tendency to develop free ammonia. This might be expected from the fact that the organic matter they contain has long been in contact with water.

The effect of the soil on the color of water is given both for colorless distilled water and for Cochituate water having an original color of about 0.55, on the scale used in the analyses of the State Board of Health. In these color determinations the water was not heated, and the length of time of contact with the soil was about 18 hours. In some cases the deeper samples actually diminished the color of the Cochituate water.

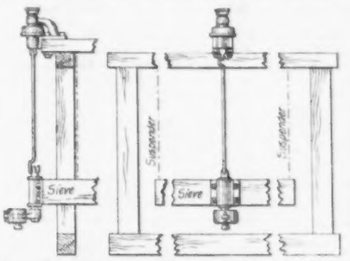
As a preliminary conclusion, based on the facts determined in this investigation, it may be said that the effect of the organic matter in these various soils on the water in contact with them is simply a question of its amount, and that its origin and composition seem to be without marked influence. The watershed from which the samples were taken is very sparsely populated, and the organic matter in all cases is mainly of vegetable origin.

It is probable, therefore, that we need only concern ourselves with the amount of organic matter in a soil of this character in determining the necessity of its removal, and as a provisional standard we may perhaps fix 1½ to 2% of organic matter, as determined by the loss on ignition of the sample dried at 100° C. (212° F.), as the permissible limit of organic matter that may be allowed to remain on the bottom and sides of a reservoir.

AN IMPROVEMENT IN SIFTING AND CONCENTRATING MACHINERY.

A valuable monograph on "The Sizing of Crushed Minerals" has recently appeared in the "Proceedings of the Institution of Civil Engineers." The paper itself, which is by Mr. R. E. Commans, Assoc. M. Inst. C. E., forms a pamphlet of some 68 pages, and the discussion and correspondence occupy nearly as large a space, the whole forming a treatise on the subject considered much too extended to admit of abstracting it in these columns. In the course of this discussion a very ingenious but simple invention for operating shaking screens was described by Mr. W. W. Beaumont. We cannot do better than to quote directly from the "Proceedings" the description of this invention, as under the able editorship of Mr. Forrest, only the meat of the discussion is presented and trivialities and unimportant matter are omitted:

Mr. W. Worby Beaumont exhibited a model explanatory of a movement which he thought would interest members concerned in the construction of machinery of the description referred to in the paper, particularly machines in which parts had to be moved in a gyratory or reciprocating fashion at high speed. In the usual way this was done either by an eccentric or crank, and it became necessary at high speed to balance the crank or eccentric shaft and the reciprocating parts very carefully. Even then it was difficult to work such machines at a very high speed, because each push and pull given to the part that had to be moved was equally and oppositely imposed upon the framing of the machine carrying the crank shaft by which the motion was secured. The model showed a very simple means of working shaking tables or screens, and of utilizing the force that hitherto had been wasted in shaking the framing or floor on which the machinery had been placed. The model did not relate to mining machinery; it showed the action for flour-mill separators, but would answer for the other purpose. The screen had to be moved, and in the ordinary way such screens were moved at a high speed, the highest number of revolutions of the crank shaft being about 600 per minute. To do that the machinery had to be made with the greatest possible care, and the balancing was a very delicate operation. He dispensed with the crank shaft and connecting-rod and actuated the machine partly by what he might call the influence of a mechanical by-product in the form of hitherto wasted energy. The screen was not a very light one, but the model represented the whole of the machinery necessary for working it. It could be easily worked at 1,200 revolutions or 2,400 strokes per minute, and the only connection between the driving mechanism and the thing that actuated the screen was a fine wire connecting-rod used only in torsion. The belt, to dignify it by that name, was just one piece of cotton thread, and that piece of thread had now been used to work the model probably for two or three million of strokes, but was still in sufficiently good condition to do the work. Simply by the influence of a piece of metal out of balance that screen could be



A New System of Operating Vibrating Screens.

made to work, as far as he knew, at any speed that might be necessary for any purpose. The model shown made as nearly as possible 1,000 double strokes per minute. The motion at one end was strictly gyratory; at the other end it was less so, and was more of a reciprocating motion. That was sufficient to set in motion light material such as bran, which, except at a very high speed, would ride with a sieve. In this case, however, when a speed was reached of more than, say, 600 revolutions per minute, almost every separate flake of bran was separated from the flour and could be seen making all sorts of curious evolutions. By other applications of the apparatus in different positions, it could be shown that with granular materials—flour, bran and so on—the very fine material such as flour would travel off in one direction, and the larger parts, disclaiming all connection with the flour, would go in the other direction. By running the machine at 3,000 strokes a minute most remarkable effects could be obtained in the sorting and separation of material. He drew attention to the fact that the screen was made to move simply by the influence of the out-of-balance of a rotating piece on that which had to be moved. There was no abutment used anywhere, so that the framing, although the screen was moving at 2,000 strokes per minute, was not sensibly affected. The screens were being used in flour-mills, where the sieves were simply hung up from the joists by leather or other suspenders. The driving belt was taken from any convenient position to rotate a vertical swinging spindle; and to show how small was the power required, he would mention that sieves weighing 110 lbs. were worked by means of a rotating piece or hooked steel rod only ⅝ in. in diameter, whereas in previous cases, when working in the ordinary way with a connecting-rod and so on, very great strength was necessary. Proof positive was given by the cotton thread that very little power was taken to operate the screen worked in the way described.

Guard gates of elevator shafts should be made at least high enough to prevent persons leaning over them to look up or down the shaft. Failure to observe this rule caused a fatal accident in New York city this week. An employee in the Edison Electric Illuminating Co.'s Building leaned over the gate to look down the shaft, and the elevator descending from above struck him, crushing his head against the top rail of the gate.

The Bessemer Land & Improvement Co., of Bessemer, Ala., has agreed to expend $325,000 on the construction of a steel plant. Mr. H. F. Debardeleben is the President of the company.

The water-power of the Falls of St. Anthony at Minneapolis is likely to be increased by 12,000 HP. by the construction of a new masonry dam at an estimated cost of $750,000. This will make the total water-power available at Minneapolis, including that to be developed by the dam now being built by the United States Government, nearly 100,000 HP. The new dam is to be undertaken by the Pillsbury-Washburn Mill Co., and Mr. Chas. A. Pillsbury is said to be now at work arranging for funds for the construction. The plans for the structure have been drawn by Mr. Wm. de la Barre, M. Am. Soc. C. E., Chief Engineer of the St. Anthony's Falls Water Power Co., of Minneapolis.

LEGAL DECISIONS OF INTEREST TO ENGINEERS.

Liability for Injuries from Electric Wires.

An electric light company, by license from the owner, had a standard on a building, which it leased to a telephone company, who had one of its employees attach its wires to it. There was access to the standard through the building, but when ordered to attach the wire to the standard, instead of going through the building he went upon the building adjoining to reach it, and was injured by one of the wires reaching from the standard. It was held that the company was not liable, though the wire was not properly insulated. The statute making telegraph companies liable for injuries resulting from their

posts, wires, etc., does not render an electric company liable for a personal injury resulting from improper insulation of the wires, since the statute of 1883, making all provisions of law in respect to the erection of telegraph and telephone lines applicable to electric light companies, relates solely to the authority of companies to erect and maintain electric lines, and not to their liability for injuries.—Hactor v. Boston Electric Light Co. (Sup. Jud. Ct. of Mass.), 37 N. E. Rep., 773.

Liability for Improper Insulation of Wires.

The statute providing that electric light companies shall safely attach their wires to sufficient supports, "and insulate them at all points of attachment," means that such wires must be insulated at the point of attachment to the support. When two business corporations or two persons, under some agreement between themselves, use the same structures, owned by one of them, as support for separate lines of wire used by each for the transmission of dangerous currents of electricity, the duty of the owner of the structures is to exercise reasonable care in seeing that his wires are kept, so far as is practicable, in a safe condition at such places as the servants of the other are expressly or impliedly licensed to go in performing their duties. The fact that other circumstances must occur to render contact with such wires dangerous, if it be true, cannot excuse the owner from taking reasonable care, in view of all the circumstances likely to occur, to have its wires properly insulated at points near which the servants of another have the right to come.—Illingsworth v. Boston Electric Light Co. (Sup. Jud. Ct. of Mass.), 37 N. E. Rep., 779.

Right to Recover Payment for Void Assessment.

Where a sewer assessment, valid on its face, is void because the contract was let without advertisement for proposals, an owner of assessed property may recover a payment made by him in ignorance of the invalidity.—Mutual Life Ins. Co., of New York v. Mayor, etc., of N. Y. city (Sup. Ct., First Term, Gen. Dept.), 29 N. Y. Supp., 980.

Assessment for Sewage Pumping Works.

The Supreme Court of Illinois holds that where the corporate authorities have decided that the lands in the municipality shall be drained by means of a central reservoir, into which the sewage shall be carried by drains, and from which it shall be raised by pumps, the fact that some of the land within the municipal limits could have been drained by the gravity system does not exempt such land from liability to assessment for the proposed pumping works.—McChesney v. Village of Hyde Park, 37 N. E. Rep., 858.

Abandonment of Street.

The Appellate Court of Indiana holds, that the nonuse of a dedicated street, though extending through the period covered by the statute of limitations applicable in cases of adverse possession, will not constitute an abandonment of the street, as a street can only be abandoned by a proceeding to vacate the same. —City of Lawrenceburgh v. Wesler, 37 N. E. Rep., 956.

CONSTRUCTION NEWS.

RAILWAYS.

East of Chicago—Existing Roads.

BELLAIRE, ZANESVILLE & CINCINNATI.—It is reported that this railway will soon be changed to standard gage. It extends from Bellaire to Zanesville, O., a distance of 111 miles, and has a 3-ft. gage. Gen. Man., J. K. Geddes, Zanesville, O.

BINGHAMTON & STATE LINE.—About six miles of grading has been completed on this railway south from Binghamton, N. Y., and the surveys made to the Pennsylvania state line. The contracts for the rails have been awarded. Erastus Ross is the contractor for the road. A. K. Harvey, Ch. Engr., Binghamton, writes us that the preliminary surveys have been made and location begun for the extension south from the state line. This will be built under the name of the Binghamton, Pennsylvania & Southern, and will extend through St. Joseph, Birchardville, Rush, Stevensville, Camptown and Wyalusing, 35 miles. The right of way for this will be secured as the location progresses. The capital for the construction has been secured, but no contracts for this will be awarded before February.

BUCHANAN & ST. JOSEPH RIVER.—C. W. Hotchkiss, Engr., Niles, Mich., writes us in regard to this railway, noted Nov. 1 under St. Joseph Valley, that the work will not be completed this fall, and the company does not care to say much about it at present, but that the line has been surveyed and the first two miles north of Buchanan, Mich., are under construction. The route is from Buchanan through Berrien Springs to Benton Harbor, 25 miles. Press reports state that the company is rebuilding the St. Joseph Valley road, which was completed between Buchanan and Berrien Springs, 10 miles, a few years ago; and also that the St. Joseph Valley road has been purchased by the Michigan Central, which company will improve it and extend the line to St. Joseph, which is near Benton Harbor. Another correspondent, however, writes us that the St. Joseph Valley Co. is making improvements on its road, and that the Michigan Central is not interested in the work.

DETROIT, BAY CITY & ALPENA.—Press reports state that this railway has been sold to the bondholders and that it is proposed to consolidate with the Alpena & Northern and to build extensions to Rogers City and Cheboygan and to Bay City.

GRAND TRUNK.—This company is reported as contemplating the construction of a spur line between Brantford and Copetown, Ont.

MILLERSBURG, ASHLAND & GREENWICH.—The H. B. Camp Co. is furnishing the money and building a railway from Shreve, O., on the Pennsylvania Co.'s line to Jeromesville, 13 miles. The grading is done, seven miles of rails laid and road is expected to be completed this month. H. B. Camp, 112 Union St., Akron, O., writes us that a company will probably be organized under the charter issued last spring, and the railway extended to Ashland, O., on the Erie road.

PENNSYLVANIA MIDLAND.—The Hollidaysburg, Pa., "Register" states that this railway, which is to extend between Cessna, on the Bedford division of the Pennsylvania, and Brook's Mills, Pa., on the Altoona division, is nearing completion and will be in operation in a short time. The road will be about 25 miles long. The roadbed is completed and the rails are now being laid. It will be operated as an independent line, when finished. The road is controlled by Theo. Gerrish and others, of Maine, who are also interested in other short roads in Pennsylvania, and who own tracts of coal and mineral property along the route of the new road. Ch. Engr., J. M. Africa; Pres., G. B. Orlady, Huntingdon, Pa.

ST. CROIX & PENOBSCOT.—The proposed extension of this railway was noted in our issues of Oct. 11 and 25. James Mitchell, Gen. Man., Georges Valley R. R., Rockland, Me., writes us that he and Geo. P. Wescott, Portland, Me., have purchased the road and that surveys are now being made for an extension from Princeton to connect with the Maine Central at Tomah or Eaton, a distance of 25 or 30 miles. This will probably be built if the city of Calais will relinquish the $85,000 in bonds which it holds against the road. The line is now in operation from Calais, Me., to Princeton, Me., 21 miles.

WADDINGTON, CANTON & SOUTHERN.—H. E. Seaver, Treas., Canton, N. Y., writes us that the contract for building this railway has been awarded to W. E. Darwin & Co., Owego, N. Y., who have commenced the construction. The route is from Waddington, N. Y., through Potsdam and Madrid to Canton, 27 miles. The surveys have been completed and nearly all the right of way obtained. Pres., Jas. Spears, Canton, N. Y.; Ch. Engr., John G. Tait.

WATERVALE & BENZIE VALLEY.—Leo. F. Hale, Watervale, Mich., writes us that 4½ miles of this railway was built by the Watervale Mfg. Co., now in the hands of O. X. Wheeler, as receiver, and that no more will be built at present. The line was projected to Thompsonville, about 20 miles. The railway is owned by the Watervale Mfg. Co.

Projects and Surveys.

BRADY'S BEND COAL & IRON CO.—R. E. Rowe, Engr., Kaylor, Pa., writes us that contracts will probably be awarded within a few days for the construction of the railway to be built by this company from E. Brady, through Brady's Bend, Chicora, Greene City to Onelda, Pa., connecting there with the Pittsburg, Shenango & Lake Erie, a distance of 17½ miles. One-fourth of the route is on the company's own property. Pres., H. Billings, Boston. Ch. Engr., J. D. Hagerty.

CHICAGO, INDIANAPOLIS & CHATTANOOGA SOUTHERN.—F. L. Patrick, Pres., Columbus, O., writes us that it is hoped to arrange for the construction of this railway from Owensboro, Ky., to Mitchell, Ind., 84 miles, soon after Jan. 1. The line has been located for this 84 miles and is projected to Bedford and Indianapolis, a total distance of 190 miles. The work will include several bridges and tunnels. Ch. Engr., J. H. McCormick, Columbus, O.

COLUMBUS, HOCKING VALLEY & ATHENS.—F. F. Remple, Logan, O., writes us that the construction of this railway will be commenced immediately. The route is from Columbus, through Carroll, Lancaster, Logan and Nelsonville to Athens, a distance of about 100 miles. The project was noted in our issue of Oct. 4. Pres., A. Bauman, Columbus, O. Ch. Engr., Wm. Jennings.

QUEBEC & PACIFIC.—Canadian papers state that application will be made to Parliament next session to incorporate a company to build a railway from Quebec to Norway House, north of Lake Winnipeg, and thence to Fort Simpson, on the Pacific coast, with a branch from Montreal to the main line north of Montreal, and one from the main line at Pine Island Lake, west of Lake Winnipeg, to a deep water harbor on Hudson Bay.

Southern—Existing Roads.

ALTAMONT & MANCHESTER.—W. Woolsey, Altamont, Ky., writes us that this company hopes soon to be ready to resume the construction of its road which is projected from Altamont to Manchester, Ky., 27 miles, of which 2½ miles, from Altamont to Lu Ciel, was built in 1893. Pres., C. Crooke.

CHARLESTON, CLENDENIN & SUTTON.—The Drake & Stratton Co. is reported as pushing the construction of this railway which is being built in West Virginia. The work is being done in 10-mile sections and much of the scraper work will be let in subcontracts.

COLUMBUS SOUTHERN.—Press reports from Valdosta, Ga., state that this company is contemplating a line from Albany, Ga., through Moultrie, Valdosta, Alexanderville and around the lower edge of the Okefenokee swamp to Jacksonville.

HARRIMAN COAL & IRON.—J. B. Rodes, Harriman, Tenn., writes us that this railway has been completed. It extends from Harriman to Petros, 22 miles. Ch. Engr., C. A. Diemer, Jr.

MONTGOMERY, HAYNEVILLE & CAMDEN.—S. D. Bloch, Pres., Camden, Ala., writes us that financial preparations are being made to construct the first 20 miles of this railway. The right of way has been secured from Camden to Montgomery, 73 miles, and the first 11 miles were graded about two years ago.

POWELLTON & POCAHONTAS.—C. Scholz, Ch. Engr., Powellton, W. Va., writes us that a 1½-mile extension of this railway was completed in August, and that no more work is projected at present.

TENNESSEE CENTRAL.—It is reported that the contract for building the 25 miles of this railway between Rockwood and Monterey, Tenn., has been let to Underwood & Green, Chicago, one of the stipulations of the contract being that the contractors are to sublease 600 convicts from the Tennessee Coal & Iron Co.

Projects and Surveys.

OHIO, SANDY RIVER & ELKHORN.—John C. C. Mayo, Pres., Paintsville, Ky., writes us that it is hoped soon to complete the arrangements for securing the capital necessary to build this railway. The surveys have been completed and part of the right of way secured. The route is from Paintsville, in a southerly direction through Prestonsburg and Pikeville to Elkhorn, 75 miles. Ch. Engr., C. K. Lawrence.

ORANGE & MADISON.—J. B. Walker, Ch. Engr., Luray, Va., writes us that surveys have been completed for this railway, 16 miles in length, and that if the $50,000 subscription to be voted upon by Madison county next month is carried, the construction will be commenced early in January. Pres., M. A. Turner, Somerset, Va.

SANFORD & LILLINGTON.—Robt. Strange, Fayetteville, N. C., writes us that he has made preliminary surveys for a railway from Sanford to Lillington, N. C.

UNITED STATES COAL, IRON & MFG. CO.—This company has made final surveys for a railway from Belington, W. Va., along the Tygart River to Monroe, in Randolph county, a distance of 12 miles, and it is stated that the construction will soon be commenced. The work will probably be done by the company. Pres., W. L. Watrous, Waverly, N. Y.; Gen. Man., F. P. Rease, Belington, W. Va.

Northwest—Existing Roads.

BRAINERD & NORTHERN MINNESOTA.—A correspondent writes us that about 48 miles of the main line and 25 miles of branches will be completed next week if the weather permits, and that the road will be extended next season. Foley Bros. & Guthrie, St. Paul, are the contractors for the construction.

CHICAGO, PADUCAH & MEMPHIS.—F. P. Read, Ch. Engr., St. Elmo, Ill., writes us that this railway has been completed from Mount Vernon to Marion, Ill., 40 miles, and that tracklaying on the line between St. Elmo and Mount Vernon, about 58 miles, was commenced Nov. 6, the grading and bridging being practically done. Johnston Bros. & Faught were the general contractors. Pres., W. L. Huse; Gen. Man., B. F. Johnston, St. Elmo, Ill.

GALESBURG, ETHERLEY & EASTERN.—A correspondent writes us that this railway was opened for regular service on Nov. 1. The road is 12 miles long and starts from Wataga, Ill., on the C., B. & Q., and runs east to Etherley, the new mining town growing up at the mines of the Galesburg Coal Co. This company has 4,000 acres of superior coal, and has erected one of the most complete shaft houses in the state. The road draws exclusively on 80 square miles of excellent farming country, which with the coal freight, all of which is assured to the new line, gives promise of a large and profitable business. H. H. Windsor, 269 Dearborn St., Chicago, is interested in the line.

ST. LOUIS, COLLINSVILLE & EASTERN.—It is reported that the grading on this railway between East St. Louis and Collinsville, Ill., is being pushed rapidly, several miles having been completed during the last month. A large force of men and teams, with grading machines, are on the work and it is expected that the grading will be finished before cold weather. The road will be a direct route from East St. Louis to the coal fields near Collinsville, and will compete with the Vandalia line between these towns.

Projects and Surveys.

HOT SPRINGS & WIND CAVE.—Incorporated in South Dakota Nov. 7 to build a railway from Hot Springs to Wind Cave, 12 miles; capital stock, $150,000; incorporators, Chas. P. Stackpole, John Stabler, Geo. C. Smith, of Hot Springs, S. Dak., and others. In our issue of Oct. 11 it was stated that the Burlington & Missouri River was reported as making surveys for a short extension from Hot Springs to the entrance of Wind Cave.

Southwest—Existing Roads.

CHOCTAW, OKLAHOMA & GULF.—Geo. S. Good & Co., Lock Haven, Pa., have been awarded the contract for the extension of this railway from South McAlester to Oklahoma City, 122 miles. The road was completed from Wister Junction, Ind. T., west to South McAlester, 67 miles, and from El Reno east to Oklahoma City, 31 miles, four years ago by the Choctaw Coal & Ry. Co., but was in the hands of receivers from Jan. 8, 1891, until a few months ago, when the company was reorganized under the above name. The line is projected from Little Rock, Ark., to Albuquerque, N. Mex., with a branch to Denison, Tex. The extension for which the contract was awarded last week will include 40 miles of heavy rock cutting, but no tunnel work. The temporary office of the contractors will be at South McAlester, Ind. T., after Nov. 18. It is expected to complete the extension by next July, and that from 3,000 to 5,000 men will soon be at work on the line. The firm of Geo. S. Good & Co. is composed of Geo. S. Good, Lock Haven, Pa., and James Kerr, Clk. of the House of Representatives.

KANSAS CITY, PITTSBURG & GULF.—The syndicate that is building this and the Texarkana & Fort Smith railway is reported to have raised $4,000,000 to complete the line to the Gulf of Mexico, and it is reported that the contract for the extension of the Texarkana & Fort Smith road to Shreveport, La., has been awarded. The incorporation of the Kansas City, Shreveport & Gulf Ry. Co. to build the extension from Shreveport to Sabin Pass, Tex., was recently noted. F. B. Hubell, Secy., has established temporary headquarters at Shreveport, La.

MISSOURI, KANSAS & TEXAS.—A surveying corps is reported as again at work on an extension of this railway from San Marcos to San Antonio, Tex. The route was surveyed about a year ago by Carey A. Wilson, Ch. Engr., Parsons, Kan.

Projects and Surveys.

OKLAHOMA CENTRAL.—Press reports state that the contract has been signed for the immediate construction of a section of this railway from Hunnewell, Kan., to Parker, in the Cherokee strip. The road is projected from Arkansas City, Kan., to Vernon and El Paso, Tex., and would give the Santa Fe a direct route from Kansas City through Oklahoma and Northwestern Texas. Pres., C. G. Jones; Vice-Pres., O. P. Mistcher; Secy., Le Grand Byington; Treas., S. A. Stewart, all of Oklahoma City, Okla.

SPRINGFIELD & LITTLE ROCK.—Phil L. Dougherty and a party of surveyors are reported as surveying a route south from Springfield, Mo., to Little Rock, Ark.

WACO & PALESTINE.—G. R. Cooke & Co., Palestine, Tex., and Sam Sanger, Waco, Tex., are interested in a proposed railway between Waco and Palestine, Tex.

Rocky Mt. and Pacific—Existing Roads.

BURRARD INLET & FRASER VALLEY.—It is reported that the construction of this railway will soon be resumed. It is projected from Sumas, Wash., to Vancouver, B. C., 47 miles, and the contract for the construction was awarded in June, 1893, to King & Dickinson, Tacoma, Wash. Pres., C. D. Rand, Vancouver, B. C.

SAN PETE VALLEY.—The extension of this railway to the Morrison coal mine was formally opened Nov. 7, and O. R. Young with a party of 12 is now surveying for an extension from Moroni north to Salt Lake City. It is reported probable that the construction of this

extension will be commenced early in the spring and that the line will then be changed to standard gage.

SOUTHERN PACIFIC.—This company is reported as securing right of way for a 7-mile extension into the city of Pasadena, Cal.

Projects and Surveys.

COLORADO WESTERN.—S. M. Logan, Secy., Grand Junction, Colo., writes us that E. B. Savage is in charge of a party of engineers making preliminary surveys for this railway, which will be about 286 miles in length. The capital for the construction is in view, but no contracts have been awarded. The incorporation of this company to build a railway from Grand Junction, Colo., to Provo, Utah, was noted in our issue of Oct. 25. Pres., St. Vrain Le Sieur, Provo City, Utah.

COLORADO, WYOMING & GREAT NORTHERN.—Incorporated in Colorado to build a railway from Grand Junction, Colo., up the Green River to Green River, Wyo., on the Union Pacific, with branches to Provo City, Utah, and Meeker, Colo.; capital stock, $1,000,000; incorporators, M. T. Carpenter (Pres. and Gen. Man., Little Book Cliff Ry.), Thos. Sandford, C. F. Lass and others, all of Grand Junction, Colo. The incorporators are mostly directors of the Little Book Cliff Ry., a narrow-gage road in operation from Grand Junction to Little Book Cliff coal mines, 11 miles distant. The new company will purchase this railway and build branches.

COLUMBIA & EASTERN.—Incorporated in Oregon to build a railway from near the mouth of the Columbia River, in Clatsop county, and passing through Clatsop county toward the Nehalem valley and through Columbia, Washington, Multnomah, Clackamas, Marion, Lane, Harney and Crook counties to near the Snake River, at Ontario, or near Owyhee, Ore.; capital stock, $500,000; incorporators, Henry C. Grady, C. W. Johnson and R. W. Mitchell, of Portland. (?)

SAN DIEGO & PACIFIC.—A San Diego, Cal., report states that C. E. Mayne, J. S. Bachman, G. F. McCulloch, J. W. Cook, C. L. Heartt and others are about to file articles of incorporation for this company, which proposes to build a railway from San Diego through La Mesa, El Cajon, Santa Maria, through San Felipe Pass to Southern Nevada, Utah and eastward, with ultimate hopes of making a transcontinental line.

STREET AND ELECTRIC RAILWAYS.

HOLYOKE, MASS.—The council has granted a franchise to the Holyoke St. Ry. Co. to build its line on Northampton St. The company has petitioned for about 12,830 ft. of right of way on other streets.

HOPKINTON, MASS.—An electric railway is projected between Woodville, Hopkinton and Westboro and $50,000 of the stock has been subscribed. B. G. Underwood, Malden, and A. M. Bridgman, Brockton, heavy subscribers to the stock of the Marlboro & Westboro line, are reported as interested in the new road.

NANTASKET, MASS.—The Nantasket Electric St. Ry. Co. has been formed to construct a line to connect Hingham, Cohasset and Hull. The road will be about 4½ miles in length; capital stock, $12,500. Z. T. Harrington, C. A. Ranson, Hull; G. E. Davis, Hingham; J. C. Flood, Boston, are interested.

CENTRAL FALLS, R. I.—The Moshassuck Valley R. R. Co. has petitioned the Lincoln council for a right to extend its line and to operate the cars by storage batteries.——The Pawtucket St. Ry. Co. has petitioned for a franchise to extend its electric railway. The decision of the council has been postponed till April.

NEW BRITAIN, CONN.—F. G. Platt, Treas., writes us that right of way has been obtained and surveys made for the Berlin extension of the Central Ry. & Electric Co.'s line, 3 3-5 miles in length, noted last week. Most of the work will be done by the company which will sublet contracts for excavation, tracklaying, paving, etc. Pres., A. M. Young; Ch. Engr., E. S. Bond.

WESTPORT, CONN.—The street railway company has voted to petition the legislature for permission to change its motive power from horse to electricity and to extend the line to Compo Point. There is talk of selling the plant to the Norwalk Tramway Co., according to reports.

STAPLETON, N. Y.—The Midland Ry. Co., which operates horse car lines from Stapleton to Concord, and from West New Brighton to Four Corners, Staten Island, has applied to the supervisors for permission to equip its lines with electricity.

NEW BRUNSWICK, N. J.—The New Brunswick City Ry. Co. has been granted permission to extend its line and equip it with electricity. Supt., W. F. Price.

PHILADELPHIA, PA.—The Norristown & Perkiomen Creek Electric Ry. Co. has been incorporated with a capital stock of $150,000. The line will be built from Upper Providence through Penn Square to Norristown. Pres., Thomas H. Regan.

SCHUYLKILL HAVEN, PA.—The council has granted a franchise to the Pottsville & Reading Electric Ry. Co. for its road through the town.

BALTIMORE, MD.—The Clifton Park Ry. Co. is being organized with a capital stock of $50,000. W. J. Taylor is council for the company.

BALTIMORE, MD.—The "World" states that specifications are now ready for constructing the section of the Washington & Baltimore Electric R. R. between Laurel and Washington, and bids will be opened at the company's office on Hanover St. Dec. 1. The entire distance has been surveyed. The specifications call for 80-lb. steel rails, laid and ballasted to enable a speed of 60 miles an hour. In the first specifications three steel bridges are provided for, one to be 100 ft. long and the other two 50 ft. Provision is also made for two power houses, one at Laurel and the other near Washington. The stock is held by Messrs. Widener, Elkins, Hambleton, Dolan and Newbold, known as the Elkins-Widener syndicate. Pres., D. M. Newbold.

ATLANTA, GA.—The council has granted the Lithia Springs Electric R. R. Co. an extension of time until Feb. 5 to begin the construction of its line in the city. L. Z. Rosser is attorney for the company.

CEDARTOWN, GA.—A correspondent writes us in regard to the franchise granted to the Cedartown Improvement Co., noted last week, that the franchise was obtained to prevent other parties from securing such a franchise for speculative purposes, but that no street railway is contemplated at present.

CHATTANOOGA, TENN.—It is reported that the Electric St. Ry. Co. is considering extending its line to East Chattanooga.

COVINGTON, KY.—The Cincinnati & Rosedale St. R. R. Co. has been granted a franchise on three streets.

SPRINGFIELD, O.—Surveys are being made for an electric railway from this city to Jamestown by way of Clifton.

YOUNGSTOWN, O.—A franchise has been granted to the Niles & Mineral Ridge Electric Ry. Co. to extend its line from Niles to Girard. The Youngstown lines will be extended to Girard, making a continuous line from this city to Niles and Warren. It is expected the line will next year be extended to Cleveland.

COLUMBUS, IND.—Press reports state that the project to build an electric railway from Indianapolis to this city, and perhaps further south, is assuming definite shape. Between Greenwood and Indianapolis the right of way has been secured over a public highway and county bridges. The commissioners of Johnson county have been petitioned that an election be called in Pleasant township to vote aid to the proposed road, and to grant to its projectors the right of way over certain highways and bridges. It is claimed that Columbus is to be one of the terminal points of this line, and that power stations will be put in at Edinburgh, Franklin, Greenwood and this city. Add streets

CHICAGO, ILL.—A contract for 600 motors and 3,600 HP. generators for the North Chicago and West Chicago St. Ry. lines has been awarded to the General Electric Co., New York, according to reports. It is stated that about $4,000,000 will be spent for equipping the lines controlled by C. T. Yerkes with electricity. ——It is reported that a plan is being considered for converting the Evanston branch of the Chicago, Milwaukee & St. Paul R. R. into an electric railway, with the terminal at the head of Michigan Ave. The road is about 14 miles in length, terminating at Llewellyn Park. E. S. Dreyer and W. M. Hoyt are interested.

ST. LOUIS, MO.—The Penny-Meyers Construction Co., Chicago, Pres. W. W. Penny, is reported as having signed a contract with the Mid-Suburban R. R. Co. for constructing an electric line eight miles in length, work to commence Nov. 20. The power house will be located at Yeddo Park. Extensions are to be built as rapidly as right of way can be secured.

AYLMER, ONT.—The council has granted a franchise, with exemption from taxes for 20 years, to an electric railway company which proposes to connect Hull with this city. A franchise for an electric light plant was also granted the same company.

BROCKVILLE, ONT.—A. B. Wilgus has petitioned the council for a franchise for an electric railway. A committee, consisting of John Stagg, A. F. Stagg and H. M. Bissell, has been appointed to consider the subject.

HIGHWAYS.

NEW YORK.—Bids are asked until Nov. 20 for macadamizing the Amboy road in Southfield, Richmond county. F. C. Vitt, Clk. Bd. Supervisors, Stapleton.——The macadam board of Queens county has received the following bids at Hempstead for macadamizing portions of road at Far Rockaway and Pearsall's:

James Caffrey (awarded contract), per lin. ft.	$2.09
Twombly & Eldert, per lin. ft.	2.43
D. C. Bouker, Jr. "	2.17
A. A. Carpenter, Portchester, N. Y., per lin. ft.	2.19
S. N. Decker & L. T. Walters, Jr., "	2.24
J. W. De Mott & Co., per lin. ft.	2.23

NEW JERSEY.—Specifications have been prepared for macadamizing a number of roads in Mercer county, some of the roads being: The Old York road and the Milford road, near Hightstown, from Ewingville schoolhouse to Federal City; the connecting piece of road along the Shabbakonk line; Pennington and Hopewell; Greenwood Ave. city line to turnpike; road from Eighth ward, by way of Fashion Stud Farm and E. C. Hutchinson's mills and back to turnpike. Engr., Joseph Watson, Trenton.

WASHINGTON.—The commissioners of Whatcom county, at New Whatcom, have awarded the contract for constructing the Fairhaven and Lake Samish road to Thomas Moran.

BRIDGES.

BUFFALO, N. Y.—The board of public works reports that the new Elmwood Ave. bridge can be repaired for $1,800. A month ago the estimate was $20,000.

NIAGARA FALLS, N. Y.—A. H. Porter, Cy. Engr., has made the preliminary surveys for a new iron bridge over the hydraulic canal at Second St.

PITTSBURG, PA.—Bids are asked until Nov. 24 for the erection of a steel bridge over the Monongahela River from South 22d St. to Forbes St., at Soho. E. M. Bigelow, Dir. Pub. Wks.

SCRANTON, PA.—The following bids were received Nov. 2 for the construction of two bridges, (1) being the price for the Roaring Brook bridge and (2) that for the Linden St. bridge; Cy. Engr., Joseph P. Phillips:

	1.	2.
Burke Bros.	$15,000	$13,225
Muldoon & Bowe.	12,589	11,062
Dunn Bros.	14,774	13,196
Joseph Hendler	23,805	18,495
Broadhead & McConville.	.....	14,739
Engineer's estimate	17,520	15,007

WASHINGTON, D. C.—Quartermaster General Batchelder has recommended that a bridge be constructed across the Potomac at or near the terminus of New York Ave., near Observatory Hill. The same recommendation was made in his report of last year.

WOODVILLE, MISS.—The board of supervisors has let the contract for a steel bridge across the Buffalo River, at $5,000. It has also agreed to stand one-third of the cost of a steel bridge across the Homochitto, provided the same does not exceed $2,000. Adams county paying the remaining two-thirds.

COLUMBUS, O.—Bids are asked until Nov. 22 for the construction of a 60-ft. plate girder bridge over the canal near Wm. Strickler's, Hamilton township. W. H. Halliday, Audr. Franklin County.

ELMWOOD PLACE, O.—The bridge across the canal at Township Ave. collapsed Nov. 4. The bridge had been condemned for some time, and authority to build a new one was granted a year ago.

TOLEDO, O.—The citizens voted by a majority of 6,317 to issue $200,000 in bonds for an up-river bridge.

DULUTH, MINN.—There is a probability that the Garfield Ave. viaduct will be built this winter. It will be 2,200 ft. long, 75 ft. wide, and have a clear head room of 22 ft. over the tracks. The estimated cost when the plans were prepared two years ago was $135,000.

DENVER, COLO.—Bids are asked until Nov. 21 for the erection of a new steel through bridge across the South Platte River at 38th St.; bridge to have two 200-ft. spans of three Pratt trusses each and to be built upon tubular foundations. A. C. Harris, Pres., Bd. Pub. Wks.

WATER-WORKS.

DEERING, ME.—There is talk of petitioning the legislature for right to construct municipal works. The contract with the Portland Water Co. will not expire for several years.

GLOUCESTER, MASS.—Both branches of the council have voted practically unanimously to renew the fight against the water company before the next legislature. The city wish either to purchase the present plant at a fair price or to construct new works.

NEW BEDFORD, MASS.—The council has passed an order authorizing an issue of $1,200,000 in bonds for improving the water supply.

ANGELICA, N. Y.—H. E. Dudley, Village Clk., writes us that the village has contracted with the Angelica Water Co. for 25 hydrants for fire purposes; supply will be by gravity; population, 1,000.

CANANDAIGUA, N. Y.—At a recent public meeting the citizens indorsed the action of the commissioners in securing plans for new works, and voted in favor of taking steps to construct the plant at a cost not to exceed $100,000. M. S. Smith, Pres. Comrs.

MIDDLETOWN, N. Y.—J. R. Croes, New York, has reported on plans for securing an increased supply; estimated cost, $95,000 to $115,000.

MONROE, N. Y.—At an election Nov. 10 the citizens voted, 58 to 15, in favor of works, and bids will be asked within a few days for the purchase of $50,000 in 30-year 4% bonds for the construction. The assessed valuation of the village is $411,000. The commissioners will probably contract for pipe to be delivered in January and February, so that it can be laid early in the spring. The plans for the works were made by Alexander Potter, New York, assisted by Fred. J. Knight, of this village, who will have charge of the construction. The supply will be by gravity from Lake Monoosaka, three miles distant. Gilbert Carpenter, Pres. Comrs.

PAWLING, N. Y.—The election called for Nov. 17, to vote on the question of works, has been postponed. Engr., C. W. Knight, Rome, N. Y.

ROCHESTER, N. Y.—E. Kuichling, Ch. Engr., writes us that the lowest bids received Nov. 9, for laying water pipe, as advertised in Engineering News, were as follows: Wm. Fuller, $1,649; Chambers & Casey, $7,085; Breyer & Albaugh, $7,689, $11,200, $7,541; Graff, Horn & Co., $1,862, for the six contracts, respectively. The prices of the lowest bids will be published next week.

KEY PORT, N. J.—Bids are asked by the commissioners for a filter plant to filter 350 gallons per minute. Rufus Ogden, Chn.

POINT PLEASANT, N. J.—The Point Pleasant Water-Works Co. has been incorporated; capital stock, $100,000; incorporators, Edward H. Murphy, Benj. F. Coles, C. W. Coles, J. J. Bridgman, and others.

SEA ISLE CITY, N. J.—Press reports state that Philadelphia capitalists have offered to put in a $50,000 plant if a franchise is granted them; supply from artesian wells.

WESTVILLE, N. J.—It is reported that a private company has offered to put in works to supply Newbold and South Westville.

BRADFORD, PA.—A contract for engines for the works has been awarded to Bovaird & Seyfang.

CANONSBURG, PA.—A proposition to supply the borough with water was noted Nov. 1. It is stated that the council has contracted for 36 fire plugs.

COLUMBIA, PA.—The Conewago Water & Power Co. has petitioned for a franchise.

EAST GREENVILLE, PA.—F. M. Keller, Town Clk., writes us that bids will be opened about Dec. 15 for constructing works, including stand-pipe, steam pump, filters, etc.; estimated cost, $16,000; population, 600; Engr., Horatio Sands, Pottstown, Pa. The vote for works was 111 to 25.

HAZLETON, PA.—The citizens have voted, 1,220 to 474, for municipal works.

MAHAFFEY, PA.—Miles Wrigley writes us that he is organizing a company to put in gravity works, to cost $15,000; population, 1,300.

SHENANDOAH, PA.—The citizens have voted, 1,208 to 182, to issue $50,000 in bonds to complete the works.

SUGAR GROVE, PA.—The citizens are reported as agitating the question of works.

WERNERSVILLE, PA.—The Wernersville Water Co., which was organized some time ago, has applied for a charter; capital stock, $15,000; directors, John Roether, S. S. Wolfskill, G. J. Klopp and others.

WASHINGTON, D. C.—Bids are asked by the district commissioners until Nov. 17 for 200 fire hydrants and 50 street hydrants.

BEDFORD CITY, VA.—The Glamorgan Co. has been awarded the contract for trenching and pipelaying for the new water supply, for which $20,000 in bonds has been voted, according to reports.

TITUSVILLE, FLA.—The council is considering the plans for works recently prepared by J. Francis Le Baron. J. W. Rogers, Clk.

TUSKEGEE, ALA.—It is reported that there is talk of putting in works.

PADUCAH, KY.—W. H. Patterson, Clk., writes us that the city is trying to purchase the works, as per ordinance granting the franchise.

BELLAIRE, O.—The Union Iron Wks., Erie, Pa., has been awarded a contract for new boilers of 300 HP. for the works, at a cost of about $1,275.

CLEVELAND, O.—Press reports state that the director of public works has been authorized to advertise

for bids to begin work on the new $25,000 tunnel and for laying a 48-in. pipe in the tunnel.

COLUMBIANA, O.—The citizens have voted, 188 to 60, to issue $30,000 in bonds for works.

ELMWOOD PLACE, O.—The vote for works stood 214 for and 177 against, and the proposition did not receive the required two-thirds vote.

LEBANON, O.—The council has passed an ordinance calling for an election Jan. 8 to vote on an issue of $50,000 in bonds for works.

OXFORD, O.—R. J. Cunningham, Secy. National Water-Works Co., Pittsburg, Pa., has written to the council in regard to a franchise for works.

ANGOLA, IND.—It is reported that surveys have been made for works.

BRIGHTWOOD, IND.—Wm. Wright, Secy. Com., writes us that the contract for plans and specifications for works, as advertised in Engineering News, has been awarded to W. S. Shields, Chicago. The committee received bids from 14 engineers, the prices ranging from $150 to $550 and from 1% to 3% of the cost of plant.

CONVERSE, IND.—The citizens have voted in favor of works. Address C. M. Blue, Clk.

DETROIT, MICH.—Bids are asked by the board until Jan. 7 for the purchase of $100,000 in 30-year 4% gold bonds for a new force main.

EATON RAPIDS, MICH.—The proposition to issue $35,000 in bonds for works was carried Nov. 6 by 103 majority, and the construction will be commenced at once.

MONROE, MICH.—John Steiner, Cy. Clk., writes us that the council contracts for a supply for one year at a time, and in case the water company will not furnish a supply for the amount appropriated, plans for new works will probably be made; population, 6,000. Bids are asked until Nov. 26 for furnishing a supply for one year, and the present works were built by the Monroe Water Co. in 1889, as stated in our issue of Nov. 1.

GIBSON CITY, ILL.—T. D. Spaulding, Mayor, writes us that the contract for works, as advertised in Engineering News, has been awarded to W. H. Wallingford, Newport, Ky., at $24,930. Sub-contracts have been awarded as follows: Sinking wells, Sands & Turner, Cincinnati; brick work, Mull & Rasmussen, Gibson City; carpenter work, Arbogast Bros.; iron work, Gibson Iron Wks.

MAYWOOD, ILL.—An artesian well is being bored to secure a supply for the town. Arthur Jones is president of the town board.

MILAN, ILL.—The council has voted to construct works to cost $14,871, according to reports.

OHIO, ILL.—Chas. Abraham, Cy. Clk., writes us that the contract for works has been awarded to the Challenge Wind Mill & Feed Mill Co., Batavia.

ELKHORN, WIS.—Jay F. Lyon, Clk., writes us that the Gray Water Supply Co., Milwaukee, has the contract for works, the construction to be begun about Nov. 1; supply from artesian well.

KAUKAUNA, WIS.—The Kaukauna Water-Works Co. has been incorporated by J. F. Moffett, J. L. Hotchkin, Hampton Coriett, P. M. Reuter; capital stock, $100,000.

BANCROFT, IA.—W. F. Laidley, Recdr., writes us that the following bids were received for constructing works:

Fairbanks, Morse & Co., Chicago	$4,952
Iowa Construction Co., Sioux City, Ia	4,650
Jackson & Moss, Des Moines, Ia	4,610

JESUP, IA.—Wm. Golden, Recdr., writes us that no steps have yet been taken by the council for works; population, 1,000.

MOVILLE, IA.—The council has received four bids for the construction of works, according to reports.

SABULA, IA.—The vote for works showed that 157 men and 36 women voted for works and 49 men and 8 women against them.

SLOAN, IA.—A well is being sunk to secure a supply. This is the second attempt.

SUMNER, IA.—Frank Wescott, Town Recdr., writes us that all bids for works will probably be in by Nov. 15; population 1,000.

MINNEAPOLIS, MINN.—The joint committee on reservoir and filter has voted to recommend that the offer of Mr. Lowry of 45 acres of land for a site for a new reservoir be accepted and that $200,000 in bonds be issued for commencing the work this fall. The estimated cost of the reservoir is $1,146,000, as stated last week.

DESHLER, NEB.—Chas. G. Low, Secy. Deshler Improvement Association, writes us that the proposed works, noted last week, are too small to ask for bids from outside parties.

GOTHENBURG, NEB.—Chas. A. Morell, Cy. Clk., writes us that an election will be held Nov. 19 to vote on an issue of bonds for works; no plans yet prepared; population, 1,000.

PINE BLUFF, ARK.—The city has made application to the U. S. Court for the appointment of a receiver for the Pine Bluff Water-Works Co.

SALISBURY, MO.—Bids are asked until Nov. 26 for constructing works, as stated in our advertising columns. T. Newbold, Cy. Clk.

RITZVILLE, WASH.—O. H. Greene, Town Clk., writes us that the contract for works has been awarded to W. H. White & Co., Spokane, Wash.; supply from wells; population, 600.

ALAMEDA, CAL.—The Oakland Water Co., of which W. J. Dingee is president, is reported about to extend its mains through the principal streets of this city, and as having already purchased about 2,800 tons of 16 to 4-in. pipe for the work. The company has recently laid a 30-in. main along the San Leandro county road from Alvarado to Oakland. It is reported that the Artesian Water Co., which supplies this city, has recently reduced its rate 25%, but that the rates offered by the new company are much lower.

LOS ANGELES, CAL.—The City Water Co. is building a tunnel 4,000 ft. long for a new supply for the southern and western portions of the city. The tunnel will be 4 ft. wide and 6 ft. high, and the water will be conveyed to a new 40,000,000-gallon reservoir, which will be built at once, according to local papers.

AMHERSTBURG, ONT.—It is reported that $9,000 in bonds will be issued for works.

HINTONBURG, ONT.—Surveys of the village have been made by E. J. Rainboth. There is talk of constructing works and sewers, according to reports.

PORT HOPE, ONT.—Plans and specifications for works are asked until Nov. 19. T. A. Thompson is a member of the council.

IRRIGATION.

NEW COMPANIES.—Six Mile Ditch & Reservoir Co., Longmont, Colo.; $20,000; J. J. Beasley, J. R. Forsyth, W. B. Neeley.

Stewart Ditch Co., Paonia, Colo.; $26,000; D. J. Stewart, J. B. Love, T. C. Ward.

Keystone Canal Co., Phoenix, Ariz.; $750,000; W. H. Hulings, H. C. Maguire, T. D. Bennett.

Thedford Irrigation & Power Co., Thedford, Neb.; $5,000; J. M. McMillan, J. H. Evans, C. C. Wright.

Blain County Irrigation Co., Brewster, Neb.; $40,000; the ditch to be 25 miles long; Pres., E. W. Rankins; Vice-Pres., S. A. Dailey; Secy., P. C. Erickson.

Brown County Irrigation Co., Brownwood, Tex.; a dam will be constructed in the Colorado River, about 25 miles north of Brownwood, and it is intended to irrigate nearly the entire Pecan Bayou Valley; Pres., D. H. Wood; Vice-Pres., S. R. Coggin; Secy., F. A. Swinden.

SEWERS.

SOUTH FRAMINGHAM, MASS.—The city has purchased about 19 acres of land for use as a filtration bed for the disposition of the underdrain water.

WINDSOR LOCKS, CONN.—J. W. Byrne, Town Clk., writes us that a committee has been appointed to secure estimates, etc., for a system, but that the committee has not yet reported and it is not probable that anything will be done at present. Address, J. E. Egan.

AUBURN, N. Y.—The construction of sewers estimated to cost about $65,000 is being discussed.

NIAGARA FALLS, N. Y.—The Niagara Falls Power Co. has petitioned the council to put in 3,000 ft. of sewer in Buffalo Ave.

WHITE PLAINS, N. Y.—Plans are being prepared for 1,800 ft. of 8-in. pipe sewers; average cut, 12 ft. Address, J. Henry Carpenter & Co.

HOBOKEN, N. J.—Bids are asked until Nov. 28 for constructing an outlet sewer in Ferry St., estimated to cost about $100,000. M. V. McDermott, Cy. Clk.; T. F. McCann, Cy. Surv.

NEWARK, N. J.—Bids are asked until Nov. 22 for constructing 3,185 ft. of 15 to 10-in. pipe sewers in four streets. J. C. Mundy, Gen. Supt. Pub. Wks.

ALLEGHENY, PA.—The board of public works has recommended the construction of a main sewer in Morgan St. The work has been under consideration for a long time.

PITTSTON, PA.—The borough of West Pittston has voted to issue $25,000 in bonds for sewers. Potter & Folwell, Pittsburg, have prepared plans and specifications.

SWARTHMORE, PA.—The citizens have voted to issue $16,000 in bonds for sewers and streets.

EUFAULA, ALA.—The council is discussing the question of a system.

CLEVELAND, O.—The construction of a sewer from the Cleveland state hospital to the Broadway sewer is being discussed by the board of control. J. H. Farley, Dir. Pub. Wks.

COLUMBUS, O.—H. C. Cannon has been awarded a contract for constructing sewers, at $7,987.

DAYTON, O.—The contract for constructing a sewer in Maple St. has been awarded to Jacob Neibert.

SANDUSKY, O.—M. J. Callan has been awarded the contract for constructing a sewer in Madison St., at $9,067.

STEUBENVILLE, O.—Bids are asked until Dec. 10 for the purchase of $100,000 in 30-year 4% water bonds. Jas. M. Reynolds, Cy. Clk.

FORT WAYNE, IND.—Bids are asked by the department of public works until Nov. 16 for constructing local sewers in two streets.

INDIANAPOLIS, IND.—W. R. Mercer & Co., have been awarded a contract for a local sewer at $1.83 per lin. ft.

KOKOMO, IND.—The council has adopted resolutions for constructing a system.

GRAND RAPIDS, MICH.—The council has passed resolutions for constructing sewers in 11 streets.

LAKE CITY, MICH.—The works have been sold to a Pennsylvania company, according to reports, and will be remodeled and extended.

RIVER FOREST, ILL.—Bids are asked untill Nov. 19 for constructing a pipe sewer in Thatcher Ave. G. W. Shearburn, Village Clk. (P. O., Oak Park. ?)

WATERTOWN, WIS.—R. T. Wilson, Milwaukee, has been awarded the contract for constructing sewers at $12,707. The bids were published Nov. 1 under Contract Prices.

DAVENPORT, IA.—Bids are asked until Nov. 22 for constructing 10-in. pipe sewers in two streets. E. W. Boynton, Comr. Pub. Wks.

DES MOINES, IA.—The contract for constructing the Capital Park system, about three miles in length, has been awarded to H. A. King, at 99 cts. per lin. ft. The bids were published in our issue of Nov. 1.

BENSON, MINN.—Anthon Arnesen, Village Recdr., writes us that the contract for constructing 4,000 ft. of 24-in. pipe sewers, average cut about 12 ft., has been awarded to Nels Erickson.

SAN ANTONIO, TEX.—The council has engaged S. M. Gray, Providence, R. I., as consulting engineer for two years, at $5,400 per year, during the construction of the sewerage system, the work on which will soon be commenced. Bonds for $500,000 have been sold to B. Thurman & Co., Chicago.

OAKLAND, CAL.—The following bids for constructing the East Lake sewer have been received by the council: A. R. Wilson & Co., $42,140; A. W. Riner, San Francisco, $26,776 (informal); and two other bids at $48,078 and $53,342. The bids will probably all be rejected and the work readvertised.

WYANDOT, ONT.—It is reported that M. L. Brown, Engr., has submitted plans for a system estimated to cost $27,000.

STREETS.

ALLEGHENY, PA.—The contract for paving Lucy St. with brick has been awarded to Carson & Hutchinson at $5,924, and the contracts for regrading and repaving Chestnut St. and Spring Garden Ave. to Keeling, Ridge & Co. at $2,213 and $7,851.

SOUTH BETHLEHEM, PA.—Bids are asked until Nov. 25 for paving, curbing, etc. M. J. Dwyer, Chn. St. Com.

CALDWELL, O.—The following bids have been received for paving North St.: E. J. Tracy, Zanesville, $6,175; C. Kennedy, Parkersburg, W. Va., $6,482; E. M. Ayers, Zanesville, $5,298, and William Young, Caldwell, $4,200. Engr., Edmund Turner, Zanesville.

CINCINNATI, O.—The Warren-Scharf Asphalt Paving Co. has been awarded the contract for paving Seventh St., at $12,671, and M. Crowley that for paving Clifton Ave. with brick at $4,983.

CLEVELAND, O.—The council has received the following bids for improving a portion of Erie St.:

The L. P. & J. A. Smith Co.	$22,585
C. H. Strong & Son	23,857
Eggers & Dennart	27,582
W. J. Gawne	29,573
John Stang	28,587
Campbell Bros	30,840

COLUMBUS, O.—Bids are asked until Nov. 20 for grading the roadway of Parsons Ave., preparatory to the paving of the avenue. J. A. Fanning, Clk.

ST. BERNARD, O.—Bids are asked until Dec. 6 for the purchase of $3,100 of 6% street improvement bonds. J. G. Overmann, Clk.

HAUGHVILLE, IND.—Bids are asked until Nov. 28 for grading and graveling a portion of Sheffield Ave. O. S. Wright, Town Clk.; Paul Julian, Surv. Marion County, Indianapolis.

LAFAYETTE, IND.—Bids are asked until Nov. 26 for improving portions of two streets. T. W. Burt, Cy. Clk.

JOLIET, ILL.—Bids are asked until Nov. 19 for constructing stone sidwalks in 13 streets. S. C. Rickson, Cy. Clk.; O. R. Rauchfuss, Cy. Engr.

MILWAUKEE, WIS.—The National Sidewalk & Paving Co. has been incorporated, with a capital stock of $15,000.

DAVENPORT, IA.—Bids are asked until Nov. 22 for grading and macadamizing Telegraph Road. E. W. Boynton, Comr. Pub. Wks.

DUBUQUE, IA.—The city engineer has prepared specifications for 35,000 sq. yds. of brick paving on concrete foundation, and 15,000 lin. ft. of curbing, and the city recorder will soon advertise for bids, the work to be commenced April 1.

SIOUX FALLS, S. DAK.—Bids are asked until Dec. 3 for constructing sidewalks. F. L. Blackman.

SEATTLE, WASH.—The board of public works has received the following bids for grading Temperance St.:

J. C. Spurr	$17,895
A. E. Ashcraft	17,224
Taylor Bros.	14,930
J. S. Holt	14,900
McFee & McDonald	14,630
E. T. Smart	14,349
J. A. Bailey	13,578
C. J. Erickson (awarded contract)	11,931

ELECTRIC LIGHT AND POWER.

PORTLAND, ME.—The machinery of the electric light plant was damaged to the extent of $100,000 by fire and water Nov. 7, according to reports.

PORTSMOUTH, N. H.—A committee has been appointed to secure information in regard to a municipal electric light plant of 125 arc lights, estimated to cost about $60,000.

HARDWICK, VT.—A village meeting has been called to discuss the putting in of an electric light plant.

MANVILLE, R. I.—The council of Lincoln has granted franchises to the Woonsocket Electric Power & Machine Co. and to the Manville Fire District for lighting this village by electricity.

NEW BRITAIN, CONN.—The New Britain Electric Co. is reported about to increase the power of its plant for the purpose of supplying Plainville with electric light.

BROOKLYN, N. Y.—The Municipal Electric Light Co. has petitioned for permission to extend its service through the western districts of the city.

LE ROY, N. Y.—Press reports state that the Le Roy Hydraulic Electric Co. has been granted permission to string wires and erect poles for transmitting electricity for heating, power and light on streets where there are now no poles.

FLEMINGTON, N. J.—The citizens have voted to light the town with electricity. A committee was appointed to inspect the systems in use in other towns. The contract for the work will probably be awarded soon.

HACKENSACK, N. J.—The plant of the Edison Electric Light Company was destroyed by fire Nov. 6, causing a loss of $30,000, according to reports.

MILLVILLE, N. J.—Bids are asked until Dec. 10 for lighting the city with electricity for five years, as stated in our advertising columns. L. H. Hogate, Cy. Recdr.

GILMERTON, VA.—It is reported that an electric light plant is to be erected, and on completion of the air line road from Portsmouth that an electric railway will probably be constructed.

AMERICUS, GA.—The council is talking of putting in a dynamo at the pumping station and supplying electric light for the city. It is estimated that a complete plant can be erected, including poles and wires, at a cost of $6,000. The city now pays $5,000 per year for lights.

DE LAND, FLA.—A company has been formed with a capital stock of $300,000 to construct an electric light and ice plant and an electric railway.

MIDDLETOWN, O.—The citizens voted Nov. 6 to

grant a franchise to H. McKnight to establish an electric light plant. Work will commence at once.

MIDDLETOWN, O.—The citizens voted on Nov. 6 to grant a 10-year franchise to the Middletown Electric Light & Power Co. for a plant in this city, work on which will be commenced at once.

KALAMAZOO, MICH.—The citizens have again voted to issue $40,000 in bonds to build an electric light plant. There are claims of an illegal election and the council may again be enjoined.

LAKE CITY, MICH.—It is reported that an electric light plant will be put in by a company that has purchased the water-works.

MONROE, MICH.—Bids are asked until Dec. 26 for 68 electric lights from Jan. 1. John Steiner, Cy. Clk.

NORTH BRANCH, MICH.—It is reported that Rochester parties will put in an electric light plant if a bonus of $400 can be secured.

GILROY, CAL.—C. Sutton, Watsonville, is interested in a project for an electric light plant at this place.

TORONTO, ONT.—J. W. St. John, representing the Georgian Bay Ship Canal & Aqueduct Co., has proposed to the mayor of Toronto Junction that a contract be made permitting the company to supply electricity for heat, light and power to that town.

NEW COMPANIES.—Mount Jewett Electric Light & Power Co., Mount Jewett, Pa.; $2,000; Treas., M. J. Gallup.

Pacific Electric Co., Pacific, Mo.; $5,020; A. H. Brown, A. Kappitz, G. H. Gross.

Potomac Light & Power Co., Georgetown, D. C.; $35,000; A. H. Wilder, V. M. Watkins, St. Paul, Minn.; G. A. King, W. E. Harvey, Washington.

Universal Electric Construction Co., Detroit, Mich.; $25,000; J. H. Talbot, W. R. McLaren, R. A. Brett.

GARBAGE DISPOSAL.

CAMDEN, N. J.—The committee on streets and highways is investigating the question of a garbage crematory to dispose of 50 tons of garbage per day. B. H. Silvers, Clk. Com.

PHILADELPHIA, PA.—The National Sanitary Furnace Co. was incorporated Nov. 8 to manufacture garbage furnaces, etc.; capital stock, $50,000, commencing business with $5,000; Treas., Francis McGill, 1332 Allegheny Ave.

YORK, PA.—The board of health recommended the cremation of the garbage of the city some time ago and it is reported that the matter will be considered at the next meeting of the council.

NORWOOD, O.—The committee has recommended that the council call an election to vote on an issue of $50,000 in bonds for a garbage crematory.

LITTLE ROCK, ARK.—H. C. Jones, Cy. Clk., writes us that correspondence is solicited on the subject of garbage disposal; population, 40,000.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

TELEPHONE FRANCHISE.—Peru, Ind.—A franchise has been granted to the Harrison Telephone Co.

STREET CLEANING.—Portland, Ore.—The council has voted to advertise for bids for cleaning and sprinkling the streets.

BOILER.—Baltimore, Md.—Bids are asked until Nov. 23 for a 50-HP. water tubular boiler for the polytechnic institute. H. M. Cowles, Secy., School Comrs.

MARINE RAILWAY.—Brunswick, Ga.—It is reported that R. E. Briesenick & Son will soon build a marine railway and have awarded the contract for the construction.

FILLING.—New Orleans, La.—Bids are asked until Nov. 21 for 18,500 cu. yds. of earth filling at the east and west jetties of the New Basin Canal at West End. L. J. Dolze, Secy., 37 Camp St.

BREWERY.—San Antonio, Tex.—It is reported that $150,000 will soon be spent in enlarging the ice plant, boiler capacity and in making other extensions to the City Brewery. Otto Koehler, Man.

SHEAR LEGS.—Washington, D. C.—Bids are asked until Nov. 26 for 100-ton shear legs at League Island navy yard (postponement of date from Nov. 5). E. O. Matthews, Chief of Bureau, Yards and Docks.

CHANNEL WORK.—Richmond, Va.—Bids are asked until Nov. 30 for deepening and widening channels of James River, Va., and for revetment of dykes and wing dams. Col. Wm. P. Craighill, U. S. Engr. Office.

LIGHTHOUSE.—Galveston, Tex.—The government has condemned an island containing about two acres near the jetties at the mouth of the Brazos River for the construction of a lighthouse, for which congress has appropriated $50,000.

MACHINE TOOLS.—Watertown, Mass.—Bids are asked until Nov. 30 for furnishing one horizontal boring, drilling and milling machine, one 5-ton j.b crane, and one 6,000-lb. steam hammer. Maj. J. W. Reilly, Ord. Dept., Watertown Arsenal.

BUILDING.—Buffalo, N. Y.—Stokes Bros., Tonawanda, N. Y., have secured the contract for the erection of the new Arcade building, which will cost about $700,000 and will be constructed largely of iron. James Mooney, Buffalo, is the chief owner.

SUBWAYS.—Newark, N. J.—The Western Union Telegraph Co. has petitioned for a franchise to construct subways in three streets. It is proposed to run two 3-in. pipes at a depth of 3 ft. through these streets, and to commence the work next month.

COUNTY BUILDINGS.—St. Joseph, Mich.—Berrien county has voted to appropriate $70,000 for county buildings to be located in this city.

Rock Island, Ill.—This county has voted to issue $125,000 in bonds for a new court house.

LAND RECLAMATION.—Islip, N. Y.—The contract for filling about 77½ acres of salt marsh land on the Great South Bay, as advertised in Engineering News, has just been awarded to Chas. Vivian & Co., Lemont, Ill. The work is to be commenced at once and completed within a year.

MUNICIPAL BUILDINGS.—Newark, N. J.—Bids are asked until Nov. 23 for all mason, carpenter, iron, cut-stone, painting, plumbing, artificial stone and heating work for new truck house No. 4, and until Nov. 26 for similar work for new second precinct police station. W. E. O'Connor, Cy. Clk.

DAM.—Minneapolis, Minn.—The "Times" states that plans are fast maturing for the construction of a $750,000 dam, which will increase the present water power of the Falls of St. Anthony 12,000 HP. Senator Washburn and Chas. A. Pillsbury are interested and the English capitalists having interests in the Pillsbury-Washburn mills will furnish the capital. Wm. de la Barre, Engr., of the Minneapolis Mill Co., has prepared the plans.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Nov. 16.	Levee work (495,000 cu.yds),	Memphis.	Nov. 1
Nov. 16.	Sewers,	Fort Wayne, Ind.	Nov. 15
Nov. 17.	Canal work,	Ottawa, Ont.	Nov. 1
Nov. 17.	Bridge,	Tacoma, Wash.	Nov. 8
Nov. 17.	Macadamizing,	Norwood, O.	Nov. 8
Nov. 17.	Hydrants (250),	Washington, D. C.	Nov. 15
Nov. 18.	Water-works system,	Cascade, Ia.	Nov. 8
	Advertised, Eng. News, Nov. 8.		
Nov. 19.	Stone,	Philadelphia, Pa.	Oct. 25
	Advertised, Eng. News, Oct. 25 to Nov. 15.		
Nov. 19.	Water extensions,	Johnstown, N. Y.	Nov. 1
Nov. 19.	Pipe sewers (3,779 ft.),	Montclair, N. J.	Nov. 8
Nov. 19.	Pipe sewer,	River Forest, Ill.	Nov. 15
Nov. 19.	Stone sidewalks,	Joliet, Ill.	Nov. 15
Nov. 19.	Water-wks., plans, etc.,	Port Hope, Ont.	Nov. 15
Nov. 20.	Dredging,	Philadelphia, Pa.	Nov. 1
Nov. 20.	Asphalt paving,	Terre Haute, Ind.	Nov. 1
Nov. 20.	Asphalt paving,	New York.	Nov. 8
Nov. 20.	Sewers,	Portsmouth, Va.	Nov. 8
	Advertised, Eng. News, Nov. 8 and 15.		
Nov. 20.	Granite paving,	New York, N. Y.	Nov. 8
Nov. 20.	Laying water main,	New York.	Nov. 8
Nov. 20.	Electric railway,	Winton Place, O.	Nov. 8
Nov. 20.	Macadamizing,	Stapleton, N. Y.	Nov. 15
Nov. 20.	Grading,	Columbus, O.	Nov. 15
Nov. 21.	Paving,	Dayton, O.	Nov. 1
Nov. 21.	Bridge superstructure,	Montreal, Que.	Nov. 8
Nov. 21.	Steel bridge,	Denver, Colo.	Nov. 15
Nov. 21.	Filling (18,500 cu. yds.),	New Orleans, La.	Nov. 15
Nov. 22.	Electric light plant,	Dayton, O.	Oct. 25
Nov. 22.	Pipe sewers,	Newark, N. J.	Nov. 15
Nov. 22.	Bridge,	Columbus, O.	Nov. 15
Nov. 22.	Pipe sewers,	Davenport, Ia.	Nov. 15
Nov. 22.	Macadamizing,	Davenport, Ia.	Nov. 15
Nov. 23.	Pipe sewers (10,000 ft.),	Warren, O.	Nov. 1
Nov. 23.	River improvement,	Ottawa, Ontario.	Nov. 1
Nov. 23.	Wooden bridges (4),	Kansas City, Mo.	Nov. 8
Nov. 23.	Boiler,	Baltimore, Md.	Nov. 15
Nov. 23.	Truck house,	Newark, N. J.	Nov. 15
Nov. 24.	Electricity for sale,	N. Westminster, B.C.	Nov. 1
Nov. 24.	Steel bridge,	Pittsburg, Pa.	Nov. 15
Nov. 25.	Paving and curbing,	South Bethlehem, Pa.	Nov. 15
Nov. 26.	Water supply,	Monroe, Mich.	Nov. 1
Nov. 26.	Bridge,	Houston, Tex.	Nov. 1
Nov. 26.	Water-works system,	Salisbury, Mo.	Nov. 8
	Advertised Eng. News, Nov. 8 to 22.		
Nov. 26.	100-ton shear legs at Phila. navy yard.		Nov. 15
Nov. 26.	Street improvement,	Lafayette, Ind.	Nov. 15
Nov. 26.	Police station,	Newark, N. J.	Nov. 15
Nov. 27.	Public Building at Camden, Ark.		Nov. 1
	Advertised, Eng. News, Nov. 1 and 8.		
Nov. 27.	Dredging (3 contracts),	Galveston, Tex.	Nov. 8
Nov. 28.	Pumping engines,	Allegheny, Pa.	Nov. 8
Nov. 28.	Outlet sewer,	Hoboken, N. J.	Nov. 15
Nov. 28.	Grading,	Haughville, Ind.	Nov. 15
Nov. 30.	Interior bldg. work at,	St. Albans, Vt.	Nov. 8
	Advertised, Eng. News, Nov. 8 and 15.		
Nov. 30.	Machine tools,	Watertown Arsenal, Mass.	Nov. 15
Nov. 30.	Channel work,	Richmond, Va.	Nov. 15
Dec. 1.	Electric lighting,	Ann Arbor, Mich.	Oct. 11
Dec. 3.	Water-works system,	Newton, N. J.	Nov. 8
	Advertised, Eng. News, Nov. 8 and 15.		
Dec. 3.	Pier,	Ottawa, Ont.	Nov. 8
Dec. 3.	Sidewalks,	Sioux City, S. Dak.	Nov. 15
Dec. 6.	Street imp't bonds,	St. Bernard, O.	Nov. 15
Jan. 7.	Water bonds,	Detroit, Mich.	Nov. 15
Dec. 10.	Breakwater extension,	Buffalo, N. Y.	Nov. 8
	Advertised, Eng. News, Nov. 8 to 29.		
Dec. 10.	Water bonds ($100,000),	Steubenville, O.	Nov. 15
Dec. 10.	Electric lighting,	Millville, N. Y.	Nov. 15
	Advertised, Eng. News, Nov. 15 and 22.		
Dec. 17.	Wooden bridge,	Franklin, Neb.	Nov. 8
Dec. 26.	Electric lighting,	Monroe, Mich.	Nov. 15
No date.	Filter plant,	Key Port, N. J.	Nov. 15

CONTRACT PRICES.

DREDGING.—Philadelphia, Pa.—The following bids have been received by Maj. C. W. Raymond, U. S. Engineer Office, for dredging 255,000 cu. yds. in channel through bulkhead bar, Delaware River; Frank C. Somers, Camden, N. J., 18 cts. per cu. yd., measured in scow; American Dredging Co., Philadelphia, 13.7 cts.; Morris & Cummings Dredging Co., New York, 11.9 cts.; R. G. & J. S. Packard, New York, 14 cts.; 12,500 cu. yds. in Rancocas River, N. J.—Fred L. Somers, Philadelphia, 17 cts. per cu. yd.; Frank C. Somers, Camden, N. J., 19.4 cts.

Milwaukee, Wis.—Maj. Jas. F. Gregory, U. S. Engineer Office, received the following bids Nov. 1 for 200,000 cu. yds. of dredging at Green Bay, Wis., as advertised in Engineering News: Wisconsin Dredge & Dock Co., Manitowoc, Wis., 12¾ cts. per cu. yd.; William A. Starke, Milwaukee, Wis., 10 cts.; Conrad Starke, Milwaukee, 16 cts.; Dion Geraldine & Wm. G. Derbyshire, Chicago, 13.8 cts.; S. O. Dixon, Racine, Wis., 9.8 cts.; Green Bay Dredge & Pile Driver Co., Green Bay, Wis., 9¾ cts. (accepted); Green's Dredging Co., Chicago, 12½ cts.; C. E. Mitchell & Co., Ludington, Mich., 19.5 cts.

SEWERS.—Allegheny, Pa.—A contract for a sewer in Woodland Ave. has been awarded to Sanders & Houston, at $1.19 per ft. for 1,383 ft. of 15-in. pipe sewer, $22 each for 7 inlets and $31 each for 8 manhole shafts. The contract for a brick sewer in Verner road has been awarded to F. B. Dunn at the following prices: 42-in. arch culvert, 150 ft., at $7 per ft.; 42-in. brick sewer, 50 ft., at $5; 36-in., 1,350 ft., at $5.80; 36-in. cast iron pipe, 150 ft., at $7; inlets, at $35 each; manhole shafts, at $25.

PUMPING ENGINES.—Chicago, Ill.—The following bids were opened Nov. 12 for four pumping engines for the water-works. These engines were described in our issue of Sept. 20:

Bidder.	Name of Pumping Station.—Chic. Av. 68th St.	L'k Vw 14th St.	
H. R. Worthington.	$120,000	$88,400	$35,700 $105,400
Filer & Stowell Co.	116,500	46,400	43,400 102,600
Wm. Cramp & Sons.	151,571[1]	70,710[2]	66,068[3] 135,700[4]
" " " "	152,913[5]	....	.... 133,500[6]
" " " "	155,371[5]	....	.... 128,400[6]
Holly Mfg. Co.	90,268	45,250	43,150 97,000
E. P. Allis & Co.	129,000[7]	....	.... 93,000[7]
Fraser & Chalmers.	116,000[8]	49,500	50,300 115,000
Arthur J. Loretz	114,250	....	....
GroshonH.-D.P.Eng. Co	124,500	....	....
N. F. Palmer Jr. & Co.	154,500[9]	....	....

[1] If city furnishes masonry for boiler settings deduct $2,400, $1,000, $800 and $2,400, respectively. [2] Double acting pump. [3] For running each half separately add $2,700 to prices given. For Hill's valve gear, add $750. [4] Differential plunger pump. [5] Single acting pump. If Hill's system of valve-gear is used add in each case $2,000 to prices given. [6] If mechanical stokers are used add $5,500. [7] Horizontal tubular boilers. Add for Hawley down draft furnace $3,690. Internally fired return tubular boilers. Add for mechanical stokers $5,000. [8] Add $4,200 for mechanical stokers. [9] Informal.

DIKE WORK.—Philadelphia, Pa.—The following bids were received by Maj. C. W. Raymond, U. S. Engineer Office, Nov. 5, for repairing and strengthening the pile and stone dike at bulkhead bar, Delaware River; Delaware Construction Co., Wilmington, Del., 9.80 ft. Georgia or Florida pine timber, $50 per M. ft.; 150 lbs. wrought iron, 4 cts. per lb.; 8,000 cu. yds. stone for buttress and filling, $1.45 per cu. yd.; total, $11,690. Leiper & Lewis, Chester, Pa., $50; 6 cts.; $1.44; $11,574. Brandywine Granite Co., Wilmington, $75; 7 cts.; $1.19; $9,598.

HARBOR WORK.—Milwaukee, Wis.—The following bids were received by Maj. James F. Gregory, U. S. Engineer Office, Nov. 1, (1) being the price for round piles, (2) for pine sheet piling, (3) white oak timber, (4) white pine timber, (5) white pine decking, (6) stone, (7) iron screw bolts and tie-rods and (8) for iron spikes, all for pile pier extension at Kewaunee Harbor, Wis.; (9) total bid for 325 ft.; (10) total bid for constructing 400 ft. of breakwater at Manitowoc Harbor, Wis., and (11) total bid for 900 ft. of pile pier construction in Sheboygan Harbor:

Bids Received by Maj. James F. Gregory, U. S. Engineer Office, Milwaukee, Wis., for Harbor Work.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Hiero B. Herr & Co., Chicago, Ill.	$.19	$26.00	$50.00	$23.00	$18.00	$6.00	$.03	$.03	$14,346	$29,697	$16,420
Wis. Dredge & Dock Co., Manitowoc.	.163	25.33	36.00	19.38	16.24	4.74	.02	.02	11,750	24,678	14,429
Riebold, Wolter & Co., Sheboygan.	.19	28.00	40.00	22.00	16.00	5.20	.0375	.04	13,341	.....	16,774
F. M. Knapp & E. Gillen, Racine.	.18	30.00	50.00	21.00	18.00	5.25	.05	.03	13,685	29,336	18,193
D. Geraldine & W. G. Derbyshire[1].	.19	26.00	38.00	22.00	16.50	4.80	.03	.04	12,824	30,684	17,316
P. W. Galloway, Racine, Wis.	.19	28.00	45.00	22.00	16.00	4.90	.03	.04	13,062	27,880	15,346
Green's Dredging Co., Chicago, Ill.	.18	28.00	35.00	28.00	20.00	6.00	.04	.04	14,153	37,982	16,745
G. W. Cronter & J. Munroe[2].	.34	38.00	40.00	23.00	20.10	8.25	.0375	.04	20,528	.....	.....
John M. Borgman, Kewaunee, Wis.	.20	29.00	47.00	24.00	15.00	4.80	.04	.04	13,360	.....	.....
Donald A. McLeod & Wm. McLeod[3].	.24	30.00	35.00	20.00	16.00	6.25	.03	.03	15,441	29,553	18,815
McGrath & Anderson, Green Bay.	.16	22.50	37.50	25.00	20.00	4.50	.035	.035	11,614	.....	15,698
Mark English, Green Bay, Wis.	.18	26.00	43.00	23.00	23.00	4.50	.035	.04	12,094	.....	16,368
Powell & Mitchell, Marquette, Mich.	.156	25.80	38.40	22.20	18.60	4.92	.036	.042	12,209	31,749	16,522

[1] Chicago. [2] Charlevoix. [3] Manistee.

Also, Wm. A. Starke, Milwaukee, (10) $36,350; (11) $18,311; John Walter, Sheboygan, Wis., (10) $34,806; August Lantz, Milwaukee, (11) $27,851; John E. Hathaway, Milwaukee, (11) $16,923.

BRICK PAVING.—Council Bluffs, Ia.—The lowest bid opened Nov. 3 for paving Oakland Ave. with brick was that of E. A. Wickham, at $1.25 per sq. yd., the other bidders being the Des Moines Brick Co., L. C. Besley, George S. Miller, F. Stimson, J. J. Hughes, Iowa Brick Co., C. E. H. Campbell, S. Bolan & Co., and Goodman & Rishard, Omaha.

ASPHALT AND BRICK PAVING.—Utica, N. Y.—The following bids were received Nov. 5 for paving between the street railway tracks in South St.: Brick paving—W. W. Fowler, $2.50 per sq. yd.; $5 per cu. yd. for extra concrete; J. W. Johnson, $2.57 and $4; Trinidad Asphalt Refining Co., $2.47 and $3; Asphalt Paving—Warren-Scharf Asphalt Paving Co., $2.80 per sq. yd., and $5 per cu. yd. for extra concrete; Utica Paving Co., $2.18 and $4; Trinidad Asphalt Refining Co., $1.97 and $3.

Allegheny, Pa.—The contract for regrading, recurbing and renaving Lincoln Ave., from Irwin Ave. to West End Ave., with asphalt has been awarded to the Sicilian Asphalt Paving Co., at the following prices: Excavation, 2,200 cu. yds., at 50 cts. per cu. yd.; paving, 6,800 sq. yds., at $2.75 per sq. yd.; new curbing, 53 cts. per lin. ft.; resetting and redressing old curb, 20 cts. per lin. ft.; granite crossings, 300 lin. ft., 80 cts. per lin. ft.; resetting and redressing crossings, 20 cts. per lin. ft. A contract for paving in Roethlein Alley with brick has been awarded to H. C. Howard, at 47 cts. per cu. yd. for excavation, $1.50 per sq. yd. for paving with vitrified brick, 63 cts. per sq. yd. for sidewalks, 44 cts. per lin. ft. for curbing, and 78 cts. per lin. ft. for granite crossings.

GRANITE CURBING.—Washington, D. C.—The following bids were received by the district commissioners Nov. 2 for a supply of granite curbing: A. O. Venerable, Atlanta, Ga., 1,600 lin. ft. of 6 × 20-in., 88 cts. per lin. ft.; 1,000 lin. ft. of 5 × 16-in., 86 cts. per lin. ft.; A. B. Cook, Petersburg, Va., 78 cts. and 60 cts.; J. F. Manning, Washington, D. C., $1.14 and 90 cts.; Acker & Co., Washington, D. C., $1.15 and 90 cts.; George Peirce, Frankfort, Me., 79 cts. and 67 cts.; Brandywine Granite Co., Wilmington, Del., $1.15 for 5 × 16-in.

GRADING.—Washington, D. C.—The following bids were received by the district commissioners Nov. 5 for grading and improving streets, (1) being the price per square yard for 15th St. N. E., East Capitol to E St.; (2) C St. N. E., 12th St. to Tennessee Ave.; (3) M St., 12th St. to Trinidad Ave.:

	1.	2.	3.
M. F. Talty, Washington, D. C.	$0.80	$0.80	$0.80
Hussey & Brown, Washington..	0.82	0.78	.....
McGraw, Almy & Malone, Phila.	0.94	0.94	0.94
Lyons Brothers, Washington....	0.59¾	0.74¾	0.49⅞
Andrew Gleason, Washington..	0.63	0.69	0.85
Buckley & Larguey, Washington	0.59	0.74	0.66
Charles H. Eslin, Washington...	0.61	0.65	0.85
Wash. Asphalt Block & Tile Co.	0.59	0.67	....

STAND-PIPE.—St. Charles, Mo.—Bids were opened by Edward Flad, Consult. Engr., St. Louis, Nov. 9, for a 25 × 70-ft. stand-pipe, as advertised in Engineering News, and contracts were awarded as follows: Stand-pipe, Chicago Bridge & Iron Co., $4,450; casing, John Heckmann, St. Charles, $2,767; foundation, Carl Bull & Son, St. Charles, $651. Carl Bull & Son bid $2,810 for the casing, and the Chicago Bridge & Iron Co., $944 for the foundation. The other bids for the stand-pipe were the Fred. J. Meyers Mfg. Co., Hamilton, O., $4,880; John O'Brien Boiler Wks. Co., St. Louis, $5,360; Springfield Boiler & Mfg. Co., Springfield, Ill., $5,800; Shickle, Harrison & Howard Iron Co., St. Louis, $9,000; Tippett & Wood and Riter & Conley, informal.

RIVER DEEPENING.—Brockville, Ont.—E. J. Saunders, Engr., writes us that the contract for deepening the head waters of Nation River, in Augusta township, has been awarded to Alex MacKenzie, at $3,751. The bids were opened Nov. 3 and were as follows, (1) being the price per cubic yard for 17,236 cu. yds. of earth excavation and (2) the price for 736 cu. yds. of rock excavation:

	1.	2.	Total.
William Garson	$0.18	$1.50	$4,206
Alex MacKenzie	0.16	1.35	3,751
John Easton	0.18¾	1.44	4,292
Francis Hourigan	0.25	1.10	5,119
S. Armour	0.18	1.65	4,317
Clark & Connolly	0.16	1.40	3,788
J. D. Warwick	0.17½	1.10	3,825

METAL MARKET PRICES.

LEAD.—New York: 3.10 to 3.12 cts. Chicago: 2.95 cts. St. Louis: 2.9 to 2.92 cts.

NAILS.—Pittsburg: 95 cts. for wire, and 85 cts. to 90 cts. for cut at mill, in carload lots.

BARBED WIRE.—Pittsburg: galvanized, $1.95 to $2; plain, $1.2 to $1.25 for carload lots at mill.

FOUNDRY AND PIG IRON.—New York: $10 to $13. Pittsburg: $10.75 to $11.75. Chicago: $9.50 to $11.50.

TRACK MATERIAL.—New York: angle bars, 1.25 to 1.4 cts.; spikes, 1.55 to 1.7 cts.; track bolts, 2 to 2.1 cts. with square, and 2.15 to 2.3 cts. with hexagon nuts. Chicago: angle bars, 1.25 to 1.35 cts.; spikes, 1.65 to 1.75 cts.; track bolts, 1.9 to 2 cts., with hexagon nuts.

RAILS.—New York: $24 at eastern mills and at tidewater; old rails, $11 to $12 for iron and $9 to $10 for steel; steel rails, fit for relaying, $16 to $19; light rails, $22 to $24; girder rails, $24. Pittsburg: $24 to $25 for standard sections; old rails, $12 to $12.50 for iron and $10 to $10.50 for steel. Chicago: $25 to $27; old rails, $10.50 to $11 for iron and $7.25 to $10 for steel.

STRUCTURAL MATERIAL.—New York: beams, 1.3 to 1.5 cts.; channels, 1.35 to 1.5 cts.; angles, 1.25 to 1.35 cts.; tees, 1.4 to 1.6 cts.; universal mill plates, 1.25 to 1.35 cts.; steel plates, 1.25 to 1.4 cts. for tank, 1.4 to 1.5 cts. for shell, 1.6 to 1.65 cts. for flange, 1.75 to 2 cts. for ordinary firebox, 2 to 2.25 cts. for locomotive firebox. Pittsburg: beams, 1.25 to 1.35 cts.; channels, 1.25 to 1.35 cts., angles, 1.15 to 1.2 cts.; tees, 1.35 to 1.4 cts.; universal mill plates, 1.15 to 1.2 cts.; steel plates, 1.2 to 1.3 cts. for tank, 1.3 to 1.35 cts. for shell, 1.35 to 1.4 cts. for flange, 2.5 to 3.75 for ordinary firebox, and 3.35 to 3.5 cts. for locomotive firebox. Chicago: beams, 1.5 cts.; channels, 1.5 cts.; angles, 1.4 to 1.45 cts.; tees, 1.65 cts.; universal plates, 1.4 to 1.45 cts.; steel plates, 1.4 to 1.5 cts. for tank, 1.65 to 2.1 cts. for flange, 1.65 to 5 cts. for firebox.

INDUSTRIAL NOTES.

H. K. PORTER & CO., of Pittsburg, Pa., manufacturers of light locomotives, have completed a narrow-gage engine for a South American road.

THE EDWARD P. ALLIS CO. of Milwaukee, Wis., has contracts for four 1,000-HP. engines for the Metropolitan Elevated Ry. Co., of Chicago, to be used in operating the electric plant.

THE HENDRICK MFG. CO., of Carbondale, Pa., manufacturing refrigerating machinery, hydraulic presses, perforated sheet metal, screens, etc., has put in a new compound condensing engine with belted air-pump, supplied by B. W. Payne & Sons, of Elmira, N. Y., and several new machine tools.

KEOGH & GRAY, contractors, of Lancaster, Pa., are reported to have made an assignment for the benefit of creditors. They have had the contract for grading and ballasting the line of the Lancaster & Lititz electric railway. They claim that there is a large amount of money owing them by the Lancaster Construction Co.

THE C. W. HUNT CO., of New York city, is putting in at the works of the Eastman Photographic Co., at Rochester, N. Y., a system of narrow-gage tracks for handling materials. Cars loaded with glass may be transferred from one track to another by means of a transfer car with rails on top, which runs on an auxiliary track across the main tracks.

THE GEO. F. BLAKE MFG. CO., of New York, N. Y., states that the Blake pump has been adopted by the Newport News Shipbuilding & Dry Dock Co. for the U. S. gunboats numbers 7, 8 and 9. The contract includes Blake's special design of vertical duplex boiler feed-pumps, fire-pumps and bilge pumps; also an outfit of pumps for the distillers and evaporators.

S. FLORY & CO., of Bangor, Pa., are making a specialty of double-drum engines for tail rope haulage or general hoisting, made with drums placed tandem or side by side. They have double cylinders, single or double friction drums, reversible link motion, or link and friction combined. The drums are loose on the shaft and may be operated separately or together. They are of cast iron, spirally grooved, and each is provided with a powerful band-brake lined with hard wood. Several of these engines are in use operating planes at the Bangor slate quarries.

THE JOHNSON RAILROAD SIGNAL CO., of Rahway, N. J., has been awarded contracts for interlocking five grade crossings in Illinois at the following places: Mt. Vernon, where the Chicago, Paducah & Memphis R. R. crosses the Louisville & Nashville and Louisville, Evansville & St. Louis railways; St. Elmo, at the crossing of the C., P. & M. R. R. and the St. Louis, Vandalia & Terre Haute R. R., and one each at Salem and Kinmundy, where the C., P. & M. R. R. crosses a single track road. There will be four interlocking machines required, one of 24 levers, one of 16 levers, and two of 12 levers. These will be of the Johnson improved pattern, with interchangeable parts. This company will also build the towers. This work is to be put in hand at once and completed as soon as possible. The company has just completed contracts for signaling at three drawbridges on the New Orleans & Northeastern Ry., one at Pearl River, and two at Lake Pontchartrain trestle, near New Orleans.

NEW COMPANIES.—Calumet Construction Co., Chicago, Ill.; $10,000; E. H. Gorse, James W. Burson and C. W. Howe.

Wade Bros. Construction Co., St. Louis, Mo.; $40,000; Wm. Wade and Edward Gutgesell.

Colorado Gilsonite Asphaltum Co., St. Louis, Mo.; $18,000; J. W. Taylor, Joseph Charles and Edward Hermann.

Rogers McDonald Pressed Brick Co., Chicago, Ill.; $250,000; S. W. Bradford, Atlee V. Cole and F. J. Patterson.

Pacific Land Improvement Co., Aurora, Ill.; $200,000; irrigation, etc.; M. V. Allen, Joseph Ray and J. H. Murphy.

Kalama River Floodgate & Dam Co., Kalama, Wash.; $50,000; Peter Wallace, A. T. Brewer and J. C. Darnell.

Mannesmann Tube Co., Jersey City, N. J.; $10,000,000; rolled tubes; Robert Mannesmann, Bayonne, N. J.; C. H. Williams, 99 Nassau St., New York.

Western Mfg. Co., Swissvale, Pa.; $25,000; manufacture of machinery; Treas., Andrew Hopkins.

Diamond Drill & Machine Co., Birdsboro, Pa.; $10,000; Treas., Leslie Griscom.

National Sanitary Furnace Co., Philadelphia, Pa.; $50,000; garbage furnaces; Treas., Francis McGill, 1332 Allegheny Ave., Philadelphia.

Superior Pump & Windmill Co., Chicago, Ill.; $25,000; Edward S. Elliott, W. Brace and John G. Campbell.

Perfect Smoke Consumer Co., Chicago, Ill.; $250,000; R. W. Cavanaugh, T. A. Switz and T. S. Quincy.

Kansas Oil & Gas Co., Claremont, Ind. Ter.; $10,000; Pres., T. A. Neilson; Vice-Pres., J. J. Barndollar; Secy., M. A. E. Patton.

New Era Construction Gas & Fuel Co., Newark, N. J.; $200,000; Percy Thompson and C. R. Knapp, of New York; Franklin Noble, of Jersey City, N. J.

Goodwin Car Co., Chicago, Ill.; $2,000,000; John M. Goodwin, Joseph J. Koehle and G. F. Rush.

MUNICIPAL BOND MARKET.

New York, Nov. 13, 1894.

The continued weakness in money rates has again made municipal bonds more prominent than ever in the markets for investment issues. As an indication of the plethora of funds, several New York banking houses who have been carrying over every day such large amounts of money that cannot be used, have notified customers that it will be impossible hereafter to continue allowing interest on such deposits. This action has, of course, resulted in adding these customers to the already large class of investors who are in search of municipal bonds, as they desire a safe investment for their money, but are unwilling to let it out at the abnormally low rates now prevailing in the money market.

After the slightly lower quotations noted for the past few weeks, prices have again advanced beyond the highest previous prices of this year. As has been frequently pointed out, anything in the way of a first-class bond finds a quick market, and that a lower interest return than has been the case for two years past. It is pointed out in a recent table of comparative prices that in 1892 good municipal bonds were selling on about the same basis as now, viz., near 3½% for first-class issues. Quotations are not yet, however, up to the high-water mark of some eight years ago, when a similar grade of bonds was quoted on a 3¼% interest basis.

Naturally, the banks with their enormous holdings of funds which they can only place on call at rates that bring about 1% continue to be large purchasers of good issues. It is instanced that in purchasing $3,000,000 Kansas City 4½% water-works bonds, Blair & Co., of this city, had the active co-operation of a prominent New York banking institution. The banks, though, prefer short-term bonds, as they expect to have early need of their money to supply merchants' needs once business really starts up.

Chicago reports bring to light a state of affairs exactly similar to what bankers here complain of. There is too much money for ordinary purposes out West, and the investment market is accordingly flourishing; so much so, that the feature of the financial situation is the strength of the municipal bond market, good issues netting 4% proving very attractive to investors. The cashier of the Illinois Trust and Savings Bank says that the bond market in Chicago is the best in a dozen years.

It is not feared that an issue of Government bonds will do much to interfere with the municipal bond market. An issue by the Treasury Department of even only $50,000,000 5's will, of course, check the demand for municipal bonds to some extent, but quotations will hardly be affected, as the gilt-edged issues are all absorbed, and the slightly cheaper grade of bonds now on the market offer sufficient attraction to warrant present prices being held.

A recent bond sale of importance was the disposal of $250,000 New York city 5-year 3% Park Ave. improvement bonds, awarded to the Union Trust Co. of New York at 101.01. On the 21st inst. Brooklyn will sell $100,000 4% sewerage fund bonds, payable in 1897; $150,000 4% water loan bonds, due in 1914, and $50,000 4% Soldiers' and Sailors' Monument bonds, payable in 1925. Now that consolidation of Brooklyn with New York has been agreed upon, brokers are anxiously waiting to see what effect it will have on the bidding for these bonds.

As an illustration of how short bond dealers are of municipal securities, there are several of the leading bond houses which have not published customary monthly lists of their current offerings. They have no new bonds to offer, their stock being now limited to odds and ends. The following table gives a list of bonds now in the market, and also indicates to contractors and engineers the credit obtainable by various cities and towns.

MUNICIPAL BONDS.

	Price.
City of Boston Park Loan Reg. 5s, 1914	111¾
City of Boston Park Loan Reg. 4s, 1924	115
City of St. Louis, Mo., Refunding, 4s, 1912	106
" " " " " 4s, 1918	108
Asbury Park, N. J., School 5s	106½
City of Tacoma, Wash., Water 5s	104
Salt Lake City, Utah, Water 5s	101¼

RAILWAY STOCK MARKET.

New York, Nov. 13, 1894.

Two factors have combined to bring about the changed situation in Wall Street—a situation radically opposed to the state of affairs treated of a week ago. These powerful influences were the result of last Tuesday's elections and the probability of an early bond issue wherewith to replenish the national Treasury's gold reserve. Up to this writing no official announcement of the bond issue has been promulgated, but President Cleveland is understood to be determined in the matter, and the financial world is a unit in accepting it as a remedy for whatever financial ills the country may be suffering from.

The result of the election, though discounted by Wall Street to some extent, must continue to have far-reaching effects in that it showed most conclusively that the American nation is determined to hold its officials to a strict accountability and is not yet disposed—as demonstrated by the collapse of the Populist movement and the utter defeat of the free silver propaganda—to accept any theories of dishonest money. The political complexion of the next Congress, diametrically opposed as it is to the opinions of the Executive, insure a freedom for two years at least from tariff tinkering, and that is the conservation of business interests.

Accordingly with the political horizon cleared of threatening storms, with the money market flooded with funds seeking investment, with business in general steadily mending, there is everything present to make the situation one full of hope. Wall Street has been appreciating the truth of this, and buoyancy and activity have followed upon a growing investment demand not only for bonds but for stocks also. In the past weeks prices generally moved upwards, and free and easy purchases from varied sources made a quick appearance. It is hard to determine whether the buying is for the long account in anticipation of a big upward movement, or whether it was more due to forced covering of bear contracts. In either case, however, it is easy to see that the situation is such as to only warrant continued operations on the bull side of the railway stock market. After the sharp and well-sustained advance there came a slight reaction that was not only expected but inevitable. But the setback only resulted in a narrower market, thus determining beyond any question that the majority of those now operating in the railway stock market are committed to the long side of stocks.

A recent feature of the railway stock market has been the publication of the report of Expert Little on the affairs of the bankrupt Atchison Railroad. It shows a condition far better than anticipated. Even in the worst year of its history the road earned nearly all the interest on its general mortgage bonds. Mr. Little says that the auxiliary roads are too severe a strain upon the Atchison system under the present fixed charges. There is also a net floating debt of $9,149,588. These two items will have to be principally dealt with in the reorganization.

RAILWAY STOCK MARKET.

Railway stocks.	Closing prices Nov. 13.
Alton & Terre Haute	36
Atchison, Topeka & Santa Fe	5⅜
Baltimore & Ohio	68½
Canada Southern	51½
Chesapeake & Ohio	19¾
Chicago, Burlington & Quincy	75⅛
Chicago & Northwestern	102½
Chicago, Milwaukee & St. Paul	63¾
Chicago, Rock Island & Pacific	64½
Cleveland, Cincinnati, Chicago & St. Louis	38½
Delaware, Lackawanna & Western	161
Delaware & Hudson	126¾
Hocking Valley	18
Illinois Central	92½
Lake Shore & Michigan Southern	136⅜
Louisville & Nashville	56
Missouri Pacific	29⅝
Missouri, Kansas & Texas	14½
Mobile & Ohio	18
New Jersey Central	96¾
New York Central	100
New York & New England, all s. p.	32¾
New York, New Haven & Hartford	194
New York, Chicago & St. Louis, 1st pfd.	70
New York, Lake Erie & Western	15
New York, Ontario & Western	16¾
New York, Susquehanna & Western	15¾
Northern Pacific	4¾
Northern Pacific, pfd.	18¾
Philadelphia & Reading	17¾
Richmond Terminal	17¾
St. Paul & Omaha	35⅞
Southern Pacific	19¾
Texas Pacific	10⅛
Union Pacific	13⅜
Wabash pfd.	14½
Wheeling & Lake Erie	12

BOSTON RAILWAY STOCKS.

	Nov. 13.
Boston & Albany	206
Boston & Maine	153
Fitchburg, pfd.	83
Old Colony	178

PHILADELPHIA RAILWAY STOCKS.

	Nov. 13.
Lehigh Valley	34¼
Pennsylvania Railroad	51

WATER-WORKS.—NEWTON, SUSSEX CO., N. J.

Sealed proposals will be received by the Water Commissioners of the town of Newton, New Jersey, until 3 p. m., Dec. 3, 1894, for furnishing materials, and until 3 p. m., Dec. 18, 1894, for the construction of water-works.

Summary of work:

Wrought iron intake tower, 3½ ft. diameter by 38 ft. height.

2,000 ft. 12 ins. wrought iron pipe for laying under water.

8 miles 10 ins. cast iron delivery main.

6 miles 4 to 10 ins. cast iron distributed mains, with valves, boxes, specials and hydrants.

Erection of a masonry dam, clearing lands to be overflowed, excavation of one-half mile of small canal, etc.

Bids will be received for different portions of the work.

A certified check must be sent with each bid.

Bonds and sureties will be required of those to whom contracts are awarded.

The right is reserved to reject any or all bids or to accept any which in the judgment of the engineer and the commission may seem to be for the best interest of the town of Newton.

All bids must be upon forms to be obtained from the commission, sealed and indorsed "Proposals for Materials" or "Proposals for Construction," and addressed to Alex Craig, Secretary Board of Water Commissioners, Newton, N. J.

Plans and specifications can be seen after Nov. 16, 1894, at the office of the commission in Newton or at the office of the chief engineer, 81 Warren St., New York.

LOUIS L. TRIBUS, Chief Engineer.

HIRAM C. CLARK, President,
H. J. VAN BLARCOM, Treasurer,
ALEXANDER CRAIG, Secretary, } Commissioners.

45-2t

NOTICE TO CONTRACTORS.

PORTSMOUTH, VIRGINIA, SEWERAGE.

Sealed proposals will be received at the office of the Clerk of the City Council in the City of Portsmouth, Va., until 12 o'clock noon, on the 20th day of November, 1894, for constructing sewers in the City of Portsmouth, Va.

Forms of Proposals, copies of specifications and instructions to contractors may be obtained, and the plans and profiles seen, at the Municipal Engineer's office.

Each bid must be accompanied by a deposit of $500, as a guarantee of the good faith of the bidder.

A fidelity bond in the sum of $10,000 will be required at the expense of the contractor.

The Committee on Sewerage reserves the right to reject any or all bids, without assigning the reasons therefor. Address

E. THOMPSON, Jr.,
Clerk of City Council, Portsmouth, Va.

45-2t

TO CONTRACTORS OF WATER-WORKS.

Bids will be received by the city of Salisbury, Charlton County, Mo., up to noon of the 26th day of November, 1894, for the construction of a system of water-works and developing a water supply according to plans, specifications and conditions now on file with C. C. Hammond, City Attorney.

Contractors are invited to look over the ground before bidding. The city reserves the right to reject any and all bids.

D. R. PATTERSON, Mayor.
C. C. HAMMOND, Salisbury, Mo.
Attest: T. NEWBOLD, City Clerk.
Nov. 2, 1894. 45-3t

CIVIL SERVICE COMMISSION OF THE CITY OF BROOKLYN, Office of the Secretary, City Hall, Nov. 9, 1894.—An examination for Assistant Civil Engineers, salary $1,500 to $1,800 per annum, Department of City Works, has been ordered by this commission. Blank applications may be obtained on application to the Secretary, who will also furnish any desired information. All applications must be made to the Secretary at his office, Room 4, City Hall, on or before Tuesday Nov. 20, at 4 p. m. WILLIAM J. D. CAMPBELL,
46-1t Secretary.

PROPOSALS FOR LIGHTING.

The City of Millville, New Jersey, will entertain sealed proposals until Dec. 10, 1894, for lighting the city with electricity for a period of five years. Address

L. H. HOGATE,
46-2t City Recorder.

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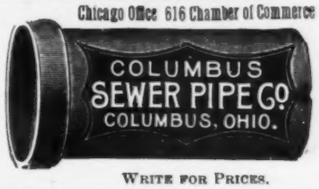

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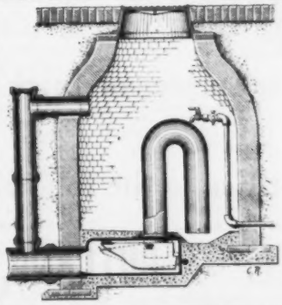

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TREASURY DEPARTMENT, Office Supervising Architect, Washington, D. C., Nov. 1, 1894.—Sealed proposals will be received at this office until 2 o'clock p. m. on the 30th day of November, 1894, and opened immediately thereafter, for all the labor and materials required for the interior finish, plumbing and approaches for the U. S. Custom House and Post Office building at St. Albans, Vt., in accordance with the drawings and specification, copies of which may be had at this office or the office of the Superintendent at St. Albans, Vt. Each bid must be accompanied by a certified check for a sum not less than 2% of the amount of the proposal. The right is reserved to reject any or all bids and to waive any defect or informality in any bid should it be deemed in the interest of the Government to do so. All proposals received after the time stated will be returned to the bidders. Proposals must be inclosed in envelopes, sealed and marked "Proposal for Interior Finish, Plumbing, etc., for the U. S. Custom House and Post Office Building at St. Albans, Vermont," and addressed to CHARLES E. KEMPER, Acting Supervising Architect. 45-2t

IMPROVEMENT OF HARBOR AT DELAWARE BREAKWATER.—U. S. Engineer Office, 1428 Arch street, Philadelphia, Pa., Oct. 18, 1894.—Sealed proposals for furnishing and depositing stone in the gap at the Delaware Breakwater, Del., will be received here until 11 a. m., Nov. 19, 1894, and then publicly opened. All information furnished on application. C. W. RAYMOND, Major Corps of Engineers. 43-4t

U. S. ENGINEER OFFICE, 905½ EAST Main street, Richmond, Va., Oct. 31, 1894.—Sealed proposals for deepening and widening channel of James River, Virginia, and for revetment of dyke and wing dams will be received here until noon Nov. 30, 1894, and then opened. For information apply to Mr. H. D. Whitcomb, at above office. WM. P. CRAIGHILL, Col. Engrs. 45-2t

U. S. ENGINEER OFFICE, NASHVILLE, Tenn., Nov. 5, 1894.—Sealed proposals for supplying stone for building Lock No. 5, Cumberland River, will be received here until 12 m., Wednesday, Dec. 5, 1894, and then publicly opened. All information furnished on application. JOHN BIDDLE, Captain Engineers. 45-4t

U. S. ENGINEER OFFICE, 121 FRANKLIN street, Buffalo, N. Y., Nov. 10, 1894.—Sealed proposals for extension of breakwater at Dunkirk Harbor, N. Y., will be received here until 2 p. m., Dec. 10, 1894, and then publicly opened. Information furnished on application to Major E. H. RUFFNER, Engineers. 45-4t

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